PB-230 510

ANALYSIS OF EFFECTIVENESS AND COSTS OF RETROFIT EMISSION CONTROL SYSTEMS FOR USED MOTOR VEHICLES. VOLUME V. APPENDICES

Olson Laboratories, Incorporated
Anaheim, California

May 1972

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ANALYSIS OF EFFECTIVENESS AND COSTS of RETROFIT EMISSION CONTROL SYSTEMS for USED MOTOR VEHICLES

volume V

appendices

prepared under
EPA Contract 68-04-0038

by
Olson Laboratories, Inc.
500 East Orangethorpe Avenue
Anaheim, California 92801

In Association With Northrop Corporation

Report 71Y233

MAY 1972

for

ENVIRONMENTAL PROTECTION AGENCY
Office of Air Programs
Division of Emission Control Technology
2565 Plymouth Road
Ann Arbor, Michigan 48105

Approved by:

D. D. Foulds
Vice President
Olson Laboratories, Inc.

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FOREWORD

The Environmental Protection Agency, as Administrator of the Clean Air Amendments Act of 1970, is required to assist States and air pollution control agencies in meeting national ambient air quality standards and mobile or stationary source emission standards, by issuing information on control techniques. Contract 68-04-0038 was performed with the Office of Air Programs, Division of Emission Control Technology, to determine what emission control techniques are feasible for retrofit to used cars, considering emission reduction effectiveness, costs, effect on vehicle performance, and the facilities and labor skills required for retrofit device installation and eventual maintenance and inspection. This report documents the results obtained, the pertinent data upon which the results are based, the techniques of test and analysis, and the recommendations for future programs to implement the results. The report consists of the following six volumes:

I. Program Summary: Highlights the principal program results and conclusions as to the overall feasibility of retrofit methods for vehicle emission control. Provides guidelines for the evaluation of retrofit approaches and the implementation of control programs.

II. System Descriptions: Documents the physical, functional, and performance characteristics of the candidate retrofit methods and their installation requirements and costs.

III. Performance Analysis: Documents the relative effectiveness and costs of retrofit methods, the techniques of analysis and testing, and the assumptions and rationale upon which the analysis was based.

IV. Test and Analytical Procedures: Documents the approach to the overall program objectives and the tasks and procedures implemented to meet the objectives.

V. Appendices: Documents the raw data obtained from retrofit development sources and data of overall applicability to the report.

VI. Addendum for Durability Tests: Documents the results of 25,000-mile durability tests on four representative retrofit devices.

NOTICE

This report was prepared for the United States Environmental Protection Agency by Olson Laboratories, Inc. pursuant to an Environmental Protection Agency contract to evaluate automotive emission control retrofit methods. The information presented in this report in no way represents any endorsement or warranty by either the contractor or the United States government of any specific device reported on; nor does it represent any conclusion about the merits of any specific device which was not evaluated. The report is based on the contractor's evaluation of laboratory data developed under the contract, retrofit developer supplied data, and government furnished data when available. The information furnished herein is believed accurate and current as of May 1972.

ACKNOWLEDGMENTS

This program was conducted under the direction and with the assistance of Dr. Jose L. Bascunana, Project Officer of the Environmental Protection Agency. Emission Control Technology, Inc., provided the methodology for performance analysis under a subcontract agreement with Olson Laboratories, Inc.

The accomplishment of this program was made possible by the cooperation and assistance of the many developers and manufacturers of retrofit devices. Their contribution of coordination time, data, and retrofit device hardware is very much appreciated.

GLOSSARY

AMA	Automobile Manufacturers Association
CEI	Cost Effectiveness Index
CI	Cost Index
CID	Cubic inch displacement
CNG	Compressed natural gas
CO	Carbon monoxide
CVS	Constant volume sampling
DI	Driveability Index
EGR	Exhaust gas recirculation
EI	Emission Index
EPA	Environmental Protection Agency
gm/mi	Grams per mile
HC	Hydrocarbons
LNG	Liquefied natural gas
LPG	Liquefied petroleum gas
MMBM	Mean-miles-before-maintenance
MMBPF	Mean-miles-before-partial-failure
MMBTF	Mean-miles-before-total-failure
mph	Miles per hour
mpg	Miles per gallon
MTTM	Mean-time-to-maintain
MTTR	Mean-time-to-repair
NDIR	Nondispersive infrared
NOx	Oxides of nitrogen
OEM	Original equipment
PCV	Positive crankcase ventilation
PI	Performance Index
ppm	Parts per million
SAE	Society of Automotive Engineers
WOT	Wide open throttle

VOLUME V

CONTENTS

Appendix		Page
	FOREWORD	iii
	ACKNOWLEDGMENTS	v
	GLOSSARY	vi
V-1	DATA SURVEY RESULTS	V-1-1
V-2	INVENTORY OF RETROFIT SOURCE DATA	V-2-1
V-3	DATA SURVEY: QUESTIONNAIRE RESPONSES	V-3-1
V-4	ALPHABETICAL INDEX - DEVELOPMENT SOURCES OF RETROFIT DEVICES EVALUATED	V-4-1

APPENDIX V-1

DATA SURVEY RESULTS

This appendix identifies all retrofit device development and information sources contacted during the retrofit study. Each source was assigned a file number for control purposes. The nature of the response from each source was categorized so that an overall profile of the retrofit development field could be established (refer to Volume II, Section 1, for discussion of results).

The device classification number is listed only for those devices for which sufficient information was obtained to evaluate them as part of the retrofit study. An "x" in the 3h field of the listing means that the device was also tested in the study.

APPENDIX V-1

DATA SURVEY RESULTS

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE									4 HARDWARE TYPE		5 COMMENTS
			DECLINED										
		NONE	NONDEVELOPER	DEVELOPER	WILL PARTICIPATE	QUESTIONNAIRE REC'D	HARDWARE EXISTS	HARDWARE REC'D	HARDWARE TESTED	IDENTIFIED OTHER SOURCES	CLASS NO.	DEVICE NAME	
		a	b	c	d	e	f	g	h	i	a	b	
1	Adaks Products, Inc. 285 Mount Read Blvd. Rochester, N.Y. 14611				x	x	x	x	x		1.2.1	Air Bleed to Intake Manifold	
2	AEC Corporation	x											3a Letter not returned
3	Air Pollution Control Association 4400 Fifth Ave. Pittsburgh, Pa. 15213 Tel (412) 621-1100		x							x			3i File Nos. 10, 227, 285
4	Air Pollution Control, Inc.												Refer to Device 10
5	Air Pollution Control Institute	x											3a Letter not returned
6	Algas, Inc.	x											3a Letter not returned
7	All American Racers Inc. Daniel Gurney, Pres.	x											3a Letter not returned
8	All-O-Matic Industries 2099 Jericho Turnpike New Hyde Park, N.Y. 11040 Tel (516) 437-2200		x										
9	American Machine & Foundry 5929 Rodeo Rd. Los Angeles, Calif.	x											3a Letter returned unopened. Address unknown
10	American Pollution Controlled, Incorporated 19900 E. Colfax Ave. Aurora, Colo. 80010				x	x	x	x	x		1.2.2	Throttle-Controlled Exhaust Gas Recirculation with Vacuum Advance Disconnect	3e Reports and performance data received in lieu of questionnaire.
11	American Oil Company	x											3a Letter not returned
12	Anpol Chemical Corp. Lakewood, Calif.	x										Anpol Formula G3	3a Letter returned unopened (insufficient address). Correct address is P.O. Box 20259, Long Beach, Calif. 90801.
13	Atlantic Richfield Co. 445 S. Figueroa St. Los Angeles, Calif. 90054 Tel (213) 629-4111	x											3b New car installation
14	Atmospheric Pollution Control Research Lab.	x											3a Letter not returned
15	Automotive Consulting Engineering	x											3a Letter not returned

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 DECLINED RESPONSE									4 HARDWARE TYPE		5 COMMENTS
		NONE	NONDEVELOPER	DEVELOPER	WILL PARTICIPATE	QUESTIONNAIRE REC'D	HARDWARE EXISTS	HARDWARE REC'D	HARDWARE TESTED	IDENTIFIED OTHER SOURCES	CLASS NO.	DEVICE NAME	
		a	b	c	d	e	f	g	h	i	a	b	
16	Automotive Environmental Systems, Inc. 3272 North E. St. San Bernardino, Calif. 92404	x											3a Letter not returned
17	Automotive News Box 5001 Anaheim, Calif.	x											3a Letter returned unopened - Order expired.
18	Automotive Performance 7138 Envoy Ct. Dallas, Tex. 75247	x											3a Letter not returned
19	Automotive Research Associates T. D. Cook	x											3a Letter not returned
20	Bathco Industries, Inc. P.O. Box 2871 Fullerton, Calif. 92633 Tel (714) 879-5805				x		x					Catalytic Converter	3b No data
21	Battelle Memorial Institute Columbus Laboratories 505 King Ave. Columbus, Ohio 43201 Tel (614) 299-3151		x							x			3i File Nos. 390, 391, 392, 393.
22	Bendix Corporation Motor Component Div. 1931 Oakwood Ave. Elmira, N.Y. 14903	x					x				1.2.6	Electronic Fuel Injection	3a Evaluation based on EPA Test Report 71-12.
23	Biap Enterprises	x					x				1.3.2	Electronic Ignition Unit	3a Evaluation based on HEW/NAPCA Report 71-7.
24	Brisko's Mileage-Saver, Inc. P.O. Box 38 Ojibwa, Wis. Tel Winter 2691			x	x		x				2.1	Heavy Duty Positive Crankcase Control Valve with Air Bleed	3d Evaluation based on miscellaneous data and EPA Test Report 71-20.
25	Bystrons Oljeprodukter Sagrenksagatan 7 Kahstad, Sweden	x											3a Letter not returned
26	California Air Resources Board Hill St. Los Angeles, Calif.	x											3a Letter not returned
27	University of Calif. 1301 S. 46th St. Richmond, Calif.	x											3a Letter not returned
28	Mr. John S. Caruso 14-38 Broadway Astoria Long Island, N.Y. 11106	x										Centrifugal Fan	3a Insufficient data

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE									4 HARDWARE TYPE		5 COMMENTS
		DECLINED											
		a NONE	b NONDEVELOPER	c DEVELOPER	d WILL PARTICIPATE	e QUESTIONNAIRE REC'D	f HARDWARE EXISTS	g HARDWARE REC'D	h HARDWARE TESTED	i IDENTIFIED OTHER SOURCES	a CLASS NO.	b DEVICE NAME	
29	Celanese Corporation of America E. Kleppinger, Environ Control	x											3a Letter not returned
30	Chevron Research Co. 576 Standard Ave. Richmond, Calif.		x										Telecon - Negative response
31	Chromalloy American Corp. 2100 W. 139th St. Gardena, Calif. 90249 Tel (213) 770-1860						x				1.1.2	Thermal Reaction by Turbine Blower Air Injection	3f Did not return questionnaire (mixed feelings for program). Sufficient data sent.
32	Clean Air Research Co. 800 Moraga Dr. Mountain View, Calif.	x											3a Letter not returned
33	Colspan, Inc. P.O. Box 3467 Boulder, Colo. 80303				x	x	x	x	x		1.2.4	Carburetor Modification, Main Jet Differential Pressure	
34	Colt Industries Holly Carburetor Div. 11955 E. Nine Mile Rd. Warren, Mich. 48090 Tel (313) 536-1900		x							x			3i See Device 10
35	Coordinating Research Council, Inc. 30 Rockefeller Plaza New York, N.Y.	x											3a Letter not returned
36	Consolidated Engineering Technology Corp. Subsidiary of Technology, Inc. 71 Forest Brockton, Mass.	x									1.4.3	Fuel Conditioning by Exposure to Electromagnetic Field	3a Letter returned: incorrect address. Evaluation based on HEW/NAPCA Test Report dated 6-70.
37	Consumer Power	x											3a Letter not returned
38(1)	Mr. George Cornelius 279 West 7th St. San Pedro, Calif. 90731 Tel (213) 833-1348			x								Exhaust Gas Recirculation	3f Patent 3,306,033
39	Custom Engineering (Ref. 158)	x											3a No data
40	Digitek	x											3a Letter not returned
41	Fansteel, Inc. 1 Tantalum Pl. Chicago, Ill. 60064	x											3a Letter not returned

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(1) Withdrew from program.

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE									4 HARDWARE TYPE		5 COMMENTS
		DECLINE									CLASS NO.	DEVICE NAME	
		NONE	NONDEVELOPER	DEVELOPER	WILL PARTICIPATE	QUESTIONNAIRE REC'D	HARDWARE EXISTS	HARDWARE REC'D	HARDWARE TESTED	IDENTIFIED OTHER SOURCES			
		a	b	c	d	e	f	g	h	i	a	b	
42	Ferry Cap & Set Screw 2151 Scranton Rd. Cleveland, Ohio 44113				x	x	x	x	x		1.2.1	Air Bleed to Intake Manifold	
43	Fuel Injection Parts Co., Inc. Robert M. Whelan, Pres	x											3a Letter not returned
44	Fuel Injection Sales & Service James E. Biewitt, Sr.	x											3a Letter not returned
45	Fuji Heavy Industries, Limited 1439 Osawa Mitaka-Shi Tokyo, Japan	x											3a Letter not returned
46	Pollution Control Div. FWI, Inc. P.O. Box 3402 Tulsa, Okla. 74101 Tel (918) 587-6731		x										3b Involved in waste water pollution control
47	Good Air Limited 25 St. Marys St. Toronto 12, Canada				x								3d Interested, but no further information
48	Gulf Oil Corporation Gulf Building P.O. Box 1166 Pittsburgh, Pa. 15230			x			x			x			3i File Nos. 396, 397, 398, 399, 400, 401, 402. 3c/f Patent 3,423,928.
49	H. R. & A. Distributors 4159 Buena Vista Suite 7 Dallas, Tex. 75205	x											3a Letter not returned. No device description. Refer to No. 178.
50	Humble Oil & Refining P.O. Box 2180 Houston, Tex. 77001		x										
51	Hurst Perform, Inc. J. McLean, Pres.		x										
52	IMPCO Carburetion Division of A.J. Industries 16916 Gridley Pl. Cerritos, Calif. 90701 Tel (213) 860-6666				x						1.4.1	LPG Conversion	3d Interested; submitted general data package. Evaluation included HEW/NAPCA Report 71-10 and report dated 2-70.
53	Illinois Institute of Technology Chicago, Ill.	x											3a Letter not returned

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 DECLINED RESPONSE									4 HARDWARE TYPE		5 COMMENTS
		NONE	NONDEVELOPER	DEVELOPER	WILL PARTICIPATE	QUESTIONNAIRE REC'D	HARDWARE EXISTS	HARDWARE REC'D	HARDWARE TESTED	IDENTIFIED OTHER SOURCES	CLASS NO.	DEVICE NAME	
		a	b	c	d	e	f	g	h	i	a	b	
54	Johns-Manville Environmental Control Systems Division P.O. Box 159 Manville, N.J. 08835 Tel (201) 722-9000		x										3b Not in a position to participate
55	J. W. Automotive Engineering Co. J. L. Weyer, Test Eng	x											3a Letter not returned
56	Porter Landrum 7225 Second Ave., South Birmingham, Ala. Tel (205) 595-0251				x	x	x	x			1.2.4	Crankcase Blowby and Idle Air Bleed Modification	3h Baseline data not available
57	Litvak & Attorney's at Law Box 1953 Denver, Colo. 80201 Tel (303) 266-0381				x	x	x	x			1.2.1	Air Bleed with Exhaust Gas Recirculation and Vacuum Advance Disconnect	3h Generation of emission data late
58	Lubrizol Corporation P.O. Box 3057 Cleveland, Ohio 4117	x											3a Letter not returned
59	Manfredi Enterprises 2947 Loran Ave. Cleveland, Ohio Tel 651-8484				x	x	x				4.0	Three-Stage Exhaust Gas Control System	3f Redesigning the device
60	Marvel Schebler	x											3a Letter not returned. Refer to Device 459.
61	University of Michigan Automotive Engineering North Campus Ann Arbor, Mich.	x											3a Letter not returned
62	Mitsui 8-7-1 Shimorenjaku, Mitaka-City Tokyo, Japan	x									1.1.1	Catalytic Converter	3a Letter not returned. No device description. Evaluation based on EPA Test Report 71-22.
63	Mobil Oil Corporation	x											3a Letter not returned
64	Nelson Muffler Corp. P.O. Box 308 Stoughton, Wis. 53589 Tel (608) 873-6641		x							x			3i File No. 102
65	New Jersey State Bureau of Air Pollution Control John Fitch Plaza P.O. Box 1390 Trenton, N.J. 08625		x							x			3i File Nos. 12, 75, 96, 244, 292, 384, 387, 400, 417, 418, 420, 421, 422, 423, 425, 426, 427, 428, 424.

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE a NONE	b NONDEVELOPER	c DEVELOPER	d WILL PARTICIPATE	e QUESTIONNAIRE REC'D	f HARDWARE EXISTS	g HARDWARE REC'D	h HARDWARE TESTED	i IDENTIFIED OTHER SOURCES	4 HARDWARE TYPE CLASS NO. a	DEVICE NAME b	5 COMMENTS
66	New York State Department of Environmental Conservation Albany, N.Y. 12001		x							x			3i File Nos. 75, 387, 389
67	North American Gas	x											3a Letter not returned
68	Novo Industrial Corp. 2199 Pacific Ave., Rm 202 San Francisco, Calif. 94115	x											3a Letter returned unopened - Moved, left no address.
69	Optimizer Control Corp. 5309 Edina Industrial Blvd. Minneapolis, Minn. 55435 Tel (612) 941-6161				x	x	x	x	x		1.3.1	Electronic Controlled Vacuum Advance Disconnect and Carburetor Lean Idle Modification	
70	Oxy-Catalyst Inc. East Biddle St. West Chester, Pa. Tel (215) 692-3500				x		x					Monolithic Catalyst Converter	3d Not interested in participating at this time. 3f Patent 3,203,168.
71	Pennsylvania Refining Company 2686 Lisbon Rd. Cleveland, Ohio 44104	x											3a Letter not returned
72	Petrolane 5037 E. Telegraph Rd. Los Angeles, Calif. 90022 Tel (213) 261-0264				x							Propane Carburetion	3d Did not return questionnaire
73	Phillips Petroleum Co. P.O. Box 792 Pasadena, Tex. 77501 Tel 472-4351		x										
74	Pott Industries 111 S. Bemiston St. Louis, Mo. 63105	x											3a Letter not returned
75	Turner & Associates 6219 Joyce Way Dallas, Tex. 75225				x	x	x	x				Ignition Spark Modification	3g Emission data not received. 3f Patent 3,019,276.
76	Mr. Charles Roberts (See Device 172)	x											3a Letter not returned
77	Roberts Induction Modification (See Device 172)	x											3a Letter not returned
78	San Diego Gas & Electric P.O. Box 1831 San Diego, Calif. 92112	x											3a Letter not returned

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 DECLINED RESPONSE									4 HARDWARE TYPE		5 COMMENTS
		NONE a	NONDEVELOPER b	DEVELOPER c	WILL PARTICIPATE d	QUESTIONNAIRE REC'D e	HARDWARE EXISTS f	HARDWARE REC'D g	HARDWARE TESTED h	IDENTIFIED OTHER SOURCES i	CLASS NO. a	DEVICE NAME b	
79	Scott Research Laboratories, Inc. P.O. Box 2416 San Bernardino, Calif. 92406 Tel (714) 887-2571		x										
80	Shell Oil Company One Shell Plaza P.O. Box 2463 Houston, Tex. 77001		x										Refer to Device 81
81	Shell Oil Company One Shell Plaza Houston, Tex. 77002		x										
82	Signal Oil & Gas Co.	x											3a Letter not returned
83	Society of Automotive Engineers, Inc. Two Pennsylvania Plaza New York, N.Y. 10001 Tel (212) 594-5700		x							x			3i File Nos. 286, 287
84	Southwest Research Inst. 8500 Culebra Rd. San Antonio, Tex.	x											3a Letter not returned
85	Specialty Equipment Manufacturers Association	x											3a Letter not returned
86	Standard Oil Company	x											3a Letter not returned
87	Standard Oil of California	x											3a Letter not returned
88	Standard Oil of Ohio			x									3a Questionnaire not returned
89	Stanford Research Inst. Client Relations & Development Menlo Pk, Calif.	x											3a Letter not returned
90	Sun Electric Corp.	x											3a Letter not returned
91	Sullivan Carburetor Development Co. "ADCO" 1500 Fieldcrest Dr. Pleasant Hill, Calif. 94523				x								3d Did not return questionnaire
92	Sun Oil Company	x											3a Letter not returned

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE									4 HARDWARE TYPE		5 COMMENTS
			DECLINED										
		a NONE	b NONDEVELOPER	c DEVELOPER	d WILL PARTICIPATE	e QUESTIONNAIRE REC'D	f HARDWARE EXISTS	g HARDWARE REC'D	h HARDWARE TESTED	i IDENTIFIED OTHER SOURCES	a CLASS NO.	b DEVICE NAME	
93	Texaco, Inc. P.O. Box 509 Beacon, N.Y. 12508			x							1.1.1	Catalytic Converter with Exhaust Gas Recirculation, Spark Modification, and Lean Idle Mixture	3c Patents 3,406,515 and 3,402,550. Evaluation based on EPA Test Report 71-26.
94	Thermasan Corporation 161 Enterprise Dr. Ann Arbor, Mich. 48106	x											3a Letter not returned
95	REI Industries, Inc. 2344 Farrington Dallas, Tex. 75207 Tel (214) 638-8270				x		x				1.3.2	Paser Magnum	3d Did not return questionnaire. Evaluated on basis of EPA test reports (see Appendix V-2, 7d and 7e, page V-2-70).
96	Universal Oil Products 30 Algonquin Rd. Des Plaines, Ill. 60016				x	x	x	x	x		1.1.1	Catalytic Converter with Distributor Vacuum Advance Disconnect	3f Patent 3,237,399
97	Union Oil of Calif. Los Angeles, Calif.	x											3a Letter not returned. Patent 3,257,798
98	Universal Oil Products Air Correction Div	x											3a Letter not returned
99	VAW of America, Inc.	x											3a Letter not returned
100	Wallace-Murray Corp. Schwitzer Division 299 Park Ave. New York, N.Y. 10017 Tel (212) 758-4000	x									1.2.5	Turbocharger	3a Letter not returned. Evaluation based on EPA Test Report dated 5-71.
101	Wisconsin Mining Co., Limited Suite 302 95 King St. East Toronto, Ontario, Canada	x											3a Letter not returned
102	W. R. Grace & Co.		x							x			3b Negative verbal reply. 3i File No. 227.
103	Zedec Enterprises	x											3a Letter not returned
104	Union Carbide Co. P.O. Box 8004 South Charleston, W.Va. 25303		x										
105	University of Wisconsin College of Engineering 1513 University Ave. Madison, Wis. 53706 Tel 262-3543		x										

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 DECLINED RESPONSE									4 HARDWARE TYPE		5 COMMENTS
		NONE a	NONDEVELOPER b	DEVELOPER c	WILL PARTICIPATE d	QUESTIONNAIRE REC'D e	HARDWARE EXISTS f	HARDWARE REC'D g	HARDWARE TESTED h	IDENTIFIED OTHER SOURCES i	CLASS NO. a	DEVICE NAME b	
106	State of North Carolina Department of Water & Air Resources P.O. Box 27048 Raleigh, N.C. 27611		x										
107	North Dakota Environmental Health & Engineering	x											3a Letter not returned
108	Oklahoma State Dept. of Health 3400 North Eastern Oklahoma City, Okla. 73105		x										
109	Oregon Air Quality Control District	x											3a Letter not returned
110	Pennsylvania Bureau of Air Pollution Control	x											3a Letter not returned
111	State of Rhode Island Department of Health 204 Health Bldg Davis St. Providence, R.I. 02908		x							x			3i File No. 383
112	South Carolina Pollution Control Authority 1321 Lady St. P.O. Box 11628 Columbia, S.C. 29211 Tel (803) 758-2915		x										
113	State of Tennessee Department of Public Health Nashville, Tenn. 37219		x										
114	Texas State Agency Division of Air Pollution Control	x											3a Letter not returned
115	Utah State Agency Utah State Division of Health	x											3a Letter not returned
116	Vermont State Agency Industrial Hygiene Div.	x											3a Letter not returned
117	Washington State Agency Washington State Department of Ecology	x											3a Letter not returned
118	West Virginia State Agency Air Pollution Control	x											3a Letter not returned

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE (EXCLUDED) NONE a	(EXCLUDED) NONDEVELOPER b	DEVELOPER c	WILL PARTICIPATE d	QUESTIONNAIRE REC'D e	HARDWARE EXISTS f	HARDWARE REC'D g	HARDWARE TESTED h	IDENTIFIED OTHER SOURCES i	4 HARDWARE TYPE CLASS NO. a	DEVICE NAME b	5 COMMENTS
119	Wisconsin State Agency Air Pollution Control	x											3a Letter not returned
120	State of Wyoming Dept. of Health & Social Services State Office Building Cheyenne, Wyo.		x										
121	Arizona State Dept. of Health Div. of Air Pollution Control 4019 N. 33rd Ave. Phoenix, Ariz.		x							x			3i File Nos. 18, 75, 277, 314, 394, 395
122	Bay Area Air Pollution Control District 939 Ellis St. San Francisco, Calif. 94109		x										
123	County of Los Angeles Air Pollution Control Dist. 434 S. San Pedro St. Los Angeles, Calif. 90013 Tel (213) 629-4711		x										
124	County of San Diego Department of Health 1600 Pacific Highway San Diego, Calif. Tel (213) 239-7711		x										
125	Colorado Department of Health Air Pollution Control Div. 4210 E. 11th Ave. Denver, Colo. 80220 Tel (303) 343-2911									x			3i File Nos. 10 and 33
126	State of Connecticut State Department of Health Environmental Health Services 79 Elm St. Hartford, Conn. 06115									x			3i See additional list
127	State of Delaware Department of Natural Resources & Environmental Control Dover, Del. 19901									x			3i File Nos. 96, 403
128	Washington D.C. Air Pollution Control Div.	x											3a Letter not returned

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 [illegible] RESPONSE									4 HARDWARE TYPE		5 COMMENTS
		NONE	NONDEVELOPER	DEVELOPER	WILL PARTICIPATE	QUESTIONNAIRE REC'D	HARDWARE EXISTS	HARDWARE REC'D	HARDWARE TESTED	IDENTIFIED OTHER SOURCES	CLASS NO.	DEVICE NAME	
		a	b	c	d	e	f	g	h	i	a	h	
129	Environmental Protection Agency Region I Office J.F. Kennedy Federal Building Boston, Mass. 02203									x			3i File No. 1
130	Environmental Protection Agency Region II Office 26 Federal Plaza New York, N.Y. 10007		x										
131	Environmental Protection Agency Region III Office Air Pollution Control Charleston, W.Va.	x											3a Letter not returned
132	Environmental Protection Agency Region IV Office Air Pollution Control	x											3a Letter not returned
133	Environmental Protection Agency Region V Office Air Pollution Control	x											3a Letter not returned
134	Environmental Protection Agency Region VI Office Air Pollution Control									x			3i File Nos. 75, 28, 282, 283, 284
135	Environmental Protection Agency Region VII Office Air Pollution Control				x								3a Questionnaire not returned
136	Environmental Protection Agency Region VIII Office Air Pollution Control	x											3a Letter not returned
137	Environmental Protection Agency Region IX Office Air Pollution Control	x											3a Letter not returned
138	Environmental Protection Agency Region X Office Air Pollution Control 1200 Sixth Ave. Seattle, Wash. 98101									x			3i File Nos. 70, 244, 433, 434, 435
139	Georgia Department of Public Health 47 Trinity Ave., S.W. Atlanta, Ga. 30334 Tel (404) 656-2000		x										
140	State of Illinois Air Pollution Control Office	x											3a Letter not returned

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 DECLINED RESPONSE									4 HARDWARE TYPE		5 COMMENTS
		NONE	NONDEVELOPER	DEVELOPER	WILL PARTICIPATE	QUESTIONNAIRE REC'D	HARDWARE EXISTS	HARDWARE REC'D	HARDWARE TESTED	IDENTIFIED OTHER SOURCES	CLASS NO.	DEVICE NAME	
		a	b	c	d	e	f	g	h	i	a	b	
141	State of Indiana State Board of Health 1330 W. Michigan St. Indianapolis, Ind. 46206		x							x			3i File No. 274
142	State of Iowa Department of Health Lucas State Office Bldg. Des Moines, Iowa 50319		x										
143	Kansas State Dept. of Health Topeka, Kans.		x										
144	State of Kentucky Air Pollution Control Office	x											3a Letter not returned
145	State of Louisiana Air Pollution Control Office	x											3a Letter not returned
146	State of Maine Air Pollution Control Office	x											3a Letter not returned
147	State of Maryland Environmental Health 2305 N. Charles St. Baltimore, Md. 21218 Tel (301) 383-2779		x										
148	State of Michigan Air Pollution Control Office	x											3a Letter not returned
149	State of Minnesota Pollution Control Agency 717 Delaware St., S.E. Minneapolis, Minn. 55440 Tel (612) 378-1320		x										
150	State of Mississippi Air & Water Pollution Control Commission P.O. Box 827 Jackson, Miss. 39205 Tel 354-6783		x										
151	State of Missouri Air Pollution Control Office	x											3a Letter not returned
152	State of Montana State Department of Health Helena, Mont. 59601		x										
153	State of Nevada Clark County Air Pollution Control Office	x											3a Letter not returned

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE (DECLINED) a NONE	b NONDEVELOPER	c DEVELOPER	d WILL PARTICIPATE	e QUESTIONNAIRE REC'D	f HARDWARE EXISTS	g HARDWARE REC'D	h HARDWARE TESTED	i IDENTIFIED OTHER SOURCES	4 HARDWARE TYPE a CLASS NO.	b DEVICE NAME	5 COMMENTS
154	State of New Jersey Air Pollution Control Office P.O. Box 1390 Trenton, N.J. 08625		x										See File No. 65
155	State of New Mexico Environmental Improvement Agency P.O. Box 2348 Santa Fe, N.M.									x			3i File Nos. 275, 276, 277
156	State of New York Air Pollution Control 50 Wolf Rd. Albany, N.Y. 12205	x											3a Letter not returned
157	Hooker Industries, Inc. 1009 W. Brooks St. Ontario, Calif. 91762 Tel (714) 983-5870				x		x					Headers	3f Unsure of effectiveness of device
158	Darwin A. Tyler 30160 Wisconsin St. Apple Valley, Calif. 92307				x							Air Fuel Control	3d Questionnaire not received
159	Clayton Manufacturing P.O. Box 550 El Monte, Calif. 91734 Tel (213) 283-4131		x										
160	Oildex Corporation P.O. Box 3755 Long Beach, Calif. 90803				x	x	x	x			2.2	Closed or Open Blowby Control System with Filter	3g Photographed device
161	General Motors Environmental Activities Staff General Motors Technical Center Warren, Mich. 48090						x						3f Device sold only in Calif.
162	Ethyl Corporation Research & Development 1600 W. Eight Mile Rd. Ferndale, Mich. 48220			x						x			3i File Nos. 164, 387, 388. 3c Patent 3,577,727; 3,495,401.
163	California Hwy Patrol P.O. Box 898 Sacramento, Calif. 95804		x										
164	Mr. Otis Jackson 6325 Lagrande Detroit, Mich. Tel (313) 892-6689				x	x	x				1.1.4	Exhaust Gas Filter	3d Emission data not received

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE (DECLINED) a NONE	b NONDEVELOPER	c DEVELOPER	d WILL PARTICIPATE	e QUESTIONNAIRE REC'D	f HARDWARE EXISTS	g HARDWARE REC'D	h HARDWARE TESTED	i IDENTIFIED OTHER SOURCES	4 HARDWARE TYPE a CLASS NO.	b DEVICE NAME	5 COMMENTS
165	Mr. Charles Penkova 147 E. 18th St. Costa Mesa, Calif. Tel (714) 646-0016				x	x	x	x			4.0	Exhaust Gas After-burner/Recirculation with Blowby and Fuel Evaporation Recirculation	
166	Allied Equipment Co. 1509 San Pablo Berkeley, Calif. Tel 526-7047				x								3d Did not return questionnaire
167	Alfa Romeo, Inc. Western Division 21[illegible] Douglas St., S. El Segundo, Calif. 90245 Tel (213) 772-4414		x										
168	Consumers Union of U.S. Auto Test Division 367 Boston Post Rd. Orange, Conn. 06477		x										
169	Rochester Products Div. of General Motors 1000 Lexington Ave. Rochester, N.Y. 14603 Tel (716) 254-5050									x			3i File No. 223
170	Automotive Association International Inc. 75 Narcissa Dr. Portuguese Bend, Calif. Tel (213) 377-8507				x	x	x				2.1	Closed Blowby Control System	
171	American Motors Corp. 14250 Plymouth Rd. Detroit, Mich. 48232		x										
172	Pollution Abatement System 9001 Rosehill Rd. Jenexa, Kans. 66215 Tel (913) 888-1221				x		x				1.2.3	Intake Manifold Modification	3d Questionnaire not returned. Reference File Nos. 76 and 77 and EPA Report 71-14.
173	Detonaire Inc. 32 E. Bridge St. Beres, Ohio 44017 Tel (216) 234-6261			x	x		x					Catalytic-Muffler	3d Questionnaire not returned
174	Stevens Institute of Technology Castle Point Station Hoboken, N.J. Tel (201) 792-2700		x							x			3i File Nos. 279, 315, 384, 385, 386

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE									4 HARDWARE TYPE		5 COMMENTS
			DECLINED										
		NONE	NONDEVELOPER	DEVELOPER	WILL PARTICIPATE	QUESTIONNAIRE REC'D	HARDWARE EXISTS	HARDWARE REC'D	HARDWARE TESTED	IDENTIFIED OTHER SOURCES	CLASS NO.	DEVICE NAME	
		a	b	c	d	e	f	g	h	i	a	b	
175	Emission Control Technology Inc. 950 N. Main St. Orange, Calif. 92667			x	x	x	x	x	x		1.3.1	Ignition Timing Modification with Lean Idle Adjustment	
176	Same as File No. 172												
177	Engine Manufacturers Assn. 111 E. Wacker Dr. Chicago, Ill. 60601 Tel (312) 644-6610		x										
178	Research Technology 2820 Ladybird Ln. Dallas, Tex. 75220				x					x			3d Questionnaire not returned. 3i File No. 49.
179	Same as File No. 34												
180	Xonics 6837 Hayvenhurst Ave. Van Nuys, Calif. 91406 Tel (213) 787-7380				x								3d Questionnaire not returned
181	Drysdale Exhaust System 22240 Prospect St. Hayward, Calif. 94541				x		x					Crankcase Ventilator	3d Questionnaire not returned
182	Combustion Chemicals 15720 Ventura Blvd. Encino, Calif. 91316 Tel (213) 986-0181				x						1.4.2	Fuel and Oil Additives	3d Questionnaire not returned. Evaluation based on miscellaneous data.
183	State Agency Chief Environmental Engr	x											3a Letter not returned
184	State of Alaska Department of Environmental Conservation Ponch O Juneau, Alaska 99801		x										
185	State of Florida Dept. of Air & Water Pollution Control 315 S. Calhoun St. Tallahassee, Fla. 32301		x										
186	State of Hawaii Chief of Air Sanitation Board	x											3a Letter not returned
187	State of Massachusetts Director, Bureau of Air Use Management	x											3a Letter not returned

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE									4 HARDWARE TYPE		5 COMMENTS
			DECLINED								CLASS NO.	DEVICE NAME	
		NONE	NONDEVELOPER	DEVELOPER	WILL PARTICIPATE	QUESTIONNAIRE REC'D	HARDWARE EXISTS	HARDWARE REC'D	HARDWARE TESTED	IDENTIFIED OTHER SOURCES			
		a	b	c	d	e	f	g	h	i	a	b	
188	State of Montana Director, Air Pollution Control Division	x											3a Letter not returned
189	State of Ohio Department of Health Air Pollution Unit 450 E. Town St. Columbus, Ohio 43216	x											
190	Commonwealth of Virginia State Air Pollution Control Board State Office Bldg. Richmond, Va. 23219 Tel (703) 770-2378		x										
191	Esso Research & Engineering Co. Linden, N.J.		x										
192	V.P., Broadway Ignition Co.	x											3a Letter not returned
193	Auto Research Laboratories Donald L. Powell	x											3a Letter not returned
194	Olson-Horiba Charles H. Oliver	x											3a Letter not returned
195	EPSCO	x											3a Letter not returned
196	Vlad Filko F&B Manufacturing Company	x											3a Letter not returned
197	United Delco	x											3a Letter not returned
198	Toyota Motor Sales U.S.A., Inc. 2055 W. 190th St. P.O. Box 2991 Torrance, Calif. 90509 Tel (213) 770-1730		x										
199	Purad, Inc.	x											3a Letter not returned
200	Mr. Fred E. Morgan	x											3a Letter not returned
201	Los Angeles Trade-Technical College, Auto Mechanics Los Angeles, Calif.		x							x			3i File Nos. 26, 90, 159, 160, 171, 197, 203, 213, 216, 217, 219, 222, 223, 227, 232, 235, 237
202	IGO	x											3a Letter not returned

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 ENCLOSED RESPONSE									4 HARDWARE TYPE		5 COMMENTS
		NONE a	NONDEVELOPER b	DEVELOPER c	WILL PARTICIPATE d	QUESTIONNAIRE REC'D e	HARDWARE EXISTS f	HARDWARE REC'D g	HARDWARE TESTED h	IDENTIFIED OTHER SOURCES i	CLASS NO. a	DEVICE NAME b	
203	Autoscan 3641 Holdrege Ave. Los Angeles, Calif. 90016	x											3a Letter not returned
204	Autolab 8190 Auto Dr. Riverside, Calif. 92504	x											3a Letter not returned
205	Joe's Tune-Up Center 500 E. Wardlow Long Beach, Calif.	x											3a Letter not returned
206	Application Research Corp. 9010 Ballanca Los Angeles, Calif. 90045	x											3a Letter returned unopened - Moved, not forwardable.
207	Automobile Club of Southern California 2601 S. Figueroa St. Los Angeles, Calif. 90007		x							x			3i File Nos. 125, 216, 227, 330, 406, 407, 408, 409, 410
208	American Honda Company 100 W. Alondra Blvd. Gardena, Calif. 90247	x											3a Letter not returned
209	Champion Spark Plug Co. 900 Upton Ave. Toledo, Ohio	x											3a Letter not returned
210	Scoville Manufacturing Company 99 Mill St. Waterbury, Conn.	x											3a Letter not returned
211	T.R.W. Inc., Engineering Div. 1455 E. 185th St. Cleveland, Ohio 44117 Tel (216) 383-4770	x											3a Letter not returned
212	M.E.P.S., Inc. 2232 S. Industrial Hwy. Ann Arbor, Mich. 48104	x											3a Letter not returned
213	AC Spark Plug Division General Motors Corp. 1300 N. Port Hwy. Flint, Mich. 48556 Tel (313) 766-5000	x											3a Letter not returned
214	ACF Industries, Inc. Carter Carburetor Div. 2840 N. Spring Ave. St. Louis, Mo. 63107 Tel (314) 531-2960				x							Carburetor	3d Participating through Optimizer Control Corp. File No. 69

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE NONE a	NONDEVELOPER b	DEVELOPER c	WILL PARTICIPATE d	QUESTIONNAIRE REC'D e	HARDWARE EXISTS f	HARDWARE REC'D g	HARDWARE TESTED h	IDENTIFIED OTHER SOURCES i	4 HARDWARE TYPE CLASS NO. a	DEVICE NAME b	5 COMMENTS
215	American Car and Foundry Industry, Inc. 2840 N. Spring Ave. St. Louis, Mo. 63107	x											3a Letter not returned
216	Walker-Manufacturing Co. Michigan Division 633 Hupp Ave. Jackson, Mich.	x		x			x						3a Letter not returned. 3c Patents 3,457,723 and 3,295,313
217	Volkswagen Pacific Inc. 11300 Playa St. Culver City, Calif. 90232	x											3a Letter returned unopened; not at this address.
218	Ford Motor Company The American Rd. Dearborn, Mich. 48121									x			3i File Nos. 10, 175, 429
219	Chrysler Corporation P.O. Box 1118 Detroit, Mich. 48231	x											3a Letter not returned
220	Rolls-Royce, Ltd. Motor Car Div. Creive, England	x											3a Letter not returned
221	British Leyland Motor Corp. Ltd. Atmosphere's Pollution Control Research Lab. Browns Ln. Coventry CV5 9DR England Tel Allesley 2121		x										
222	International Harvester Co. 2911 Meyer Rd, PO Box 1109 Fort Wayne, Indiana 46801	x											
223	General Motors Corporation 3044 West Grand Blvd. Detroit, Michigan 48202	x											
224	Jaguar Cars, Ltd. CV5 9 DR Coventry, England	x											
225	Fiat S.P.A. Strada del Drosso 145 10135 Torino (Italia)	x											
226	Renault Inc. 100 Sylvan Ave. Englewood Cliffs, N.J. 07632 Tel (201) 461-6000				x		x					1. Double Barrel Solex 26/32 DID Carburetor with Manual Choke 2. Air Filter with or without Preheating 3. Intake Manifold 4. Deceleration System	3d Questionnaire not returned
227	Norris Industries, Vernon Br. P.O. Box 56507 5215 S. Boyle Ave. Los Angeles, Calif. 90056						x					Thermal and Catalytic Afterburners	3f Questionnaire not returned. Patent 3,287,899

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE									4 HARDWARE TYPE		5 COMMENTS
		a NONE	b DECLINED NONDEVELOPER	c DECLINED DEVELOPER	d WILL PARTICIPATE	e QUESTIONNAIRE REC'D	f HARDWARE EXISTS	g HARDWARE REC'D	h HARDWARE TESTED	i IDENTIFIED OTHER SOURCES	a CLASS NO.	b DEVICE NAME	
228	Daimler-Benz Artiengesellschaft Stuttgart-Unterlurkhein, Germany	x											3a Letter not returned. Patents 3,541,785, 3,386,241, & 3,440,817
229	Standard Motor Company Coventry, England	x											3a Letter not returned
230	Audi NSU Auto Union Artiengesellschaft 8070 Ingolstadt, Germany		x										
231	Chicago Screw Company Bellwood, Ill.	x											3a Letter not returned
232	Nissan Motor Company Ltd. Takero-Cho Kanagawa-Ku Yokohama, Japan	x											3a Letter not returned
233	White Motor Company 3201 Lomita Blvd. Torrance, Calif. 90305	x											
234	Humber, Ltd. Stake Coventry, England	x											3a Letter not returned
235	Spelin, Inc. 918 Industrial Ave. Palo Alto, Calif.												3a Letter returned unopened; moved; not forwardable.
236	DePaolo Products Co. 721 Filbert St. San Francisco, Calif. 94133	x											3a Letter returned unopened; address unknown
237	K&B Manufacturing Co. 12152 S. Woodruff Ave. Downey, Calif. 90241	x											3a Letter not returned
238	Hercules Div. Canton, Ohio 44702	x											3a Letter not returned
239	Hupp Corporation Canton, Ohio 44702	x											3a Letter not returned
240	Co-Rectifire Systems, Inc. J. Owen Drake 4671 E. 11th Ave. Hialeah, Fla. 33013	x											3a Letter not returned
241	Tungstew Contract Mfg. Wm. Hollepeter 7311 Cottage Ave. N. Bergen, N.J.	x											3a Letter not returned
242	Automotive Controls Corp. Wm. H. Fergeson, Mkting Mgr 2001 Lunt Ave. Elk Grove Village, Ill.	x											3a Letter not returned

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE									4 HARDWARE TYPE		5 COMMENTS
		NONE	DECLINED NONDEVELOPER	DECLINED DEVELOPER	WILL PARTICIPATE	QUESTIONNAIRE REC'D	HARDWARE EXISTS	HARDWARE REC'D	HARDWARE TESTED	IDENTIFIED OTHER SOURCES	CLASS NO.	DEVICE NAME	
		a	b	c	d	e	f	g	h	i	a	b	
243	Echlin Mfg. Co. Echlin Rd. & U.S. 1 Branford, Conn. 06405 Tel (203) 488-7241			x									3c Interested but not at this time
244	E.I. du Pont de Nemours & Co. Petroleum Chemicals Div 612 S. Flower St. Los Angeles, Calif. 90017 Tel (213) 624-1354	x					x				1.1.2	Rich Thermal Reactor	3a Letter not returned. 3f Evaluated. Patents 3,302,394 and 3,413,803. Reference File No. 469.
245	Varicam 10457 Roselle St. San Diego, Calif. 92121				x	x	x	x	x		1.2.2	Variable Camshaft Timing	
246	Dana, Perfect Circle Div. 552 S. Washington St. Hagerstown, Ind. 47346				x	x	x	x	x		1.2.2	Speed-Controlled Exhaust Gas Recirculation with Vacuum Advance Disconnect	
247	C.B. Uhmar 7839 S. Wellsford Whittier, Calif. 90606	x											3a Letter not returned
248	D. Rossman 2 Third Pl. Long Beach, Calif.	x											3a Letter not returned
249	Mr. Gene Sposto 10707 Norlain Ave. Downey, Calif.				x		x					Afterburner device	3d Questionnaire not returned
250	Tri-Sciences Corporation 406 Rutger St. Utica, N.Y.	x											3a Letter returned unopened
251	Pur Air Research, Inc. 470 S. San Vicente Blvd. Los Angeles, Calif.	x											3a Letter returned unopened; moved; left no address.
252	R.G. Edgar 4871 Geneva Ave. Concord, Calif. 94521				x							Fuel Additive	3d Questionnaire not returned
253	J. Derugerie 695 Kenneth Ave. Campbell, Calif.	x											3a Letter not returned
254	W. Godstrey 2746 W. 9th St. Los Angeles, Calif.	x											3a Letter not returned

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE									4 HARDWARE TYPE		5 COMMENTS
		a NONE	b NONDEVELOPER	c DEVELOPER	d WILL PARTICIPATE	e QUESTIONNAIRE REC'D	f HARDWARE EXISTS	g HARDWARE REC'D	h HARDWARE TESTED	i IDENTIFIED OTHER SOURCES	CLASS NO. a	DEVICE NAME b	
255	C.F. Bahrmar 2313 N. Sparks Burbank, Calif.	x											3a Letter not returned
256	G. Carlyle 8331 Bailey Rd. Yuba City, Calif. 95991	x											3a Letter not returned
257	Azure Blue Corp. P.O. Box 496 El Dorado, Calif. 95623	x											3a Letter not returned
258	Dynatesk Industries Inc. North Brunswicks, N.J.	x											3a Letter not returned
259	Corona Engineering 2856 Show Dr. Richmond, Calif. 94806				x	x	x				1.3.2	Photocell-Controlled Ignition System	3f Received photographs
260	Instrumatics Corp. 55812-29 Palms Highway Yucca Valley, Calif. 92284	x											3a Letter not returned
261	O.R. Cedarholm 4 Cedar Ln. Eureka, Calif. 95501	x											3a Interested but letter not returned
262	J. Fernandez 1620 S. Myrtle Ave. Monrovia, Calif. 91016	x											3a Letter not returned
263	Monocar HC Vacuum Control Valves 311 Nakoma St. San Antonio, Tex.	x											3a Letter returned unopened; not at this address.
264	"Less Smog" W. Murray 10531 Acacia St. Garden Grove, Calif.	x											3a Letter not returned
265	A.C. Hewitt 1469 Rose Villa St. Pasadena, Calif.	x											3a Letter not returned
266	Exhaust Aid Corp. 2603 N. Downer Ave. Milwaukee, Wis. 53211	x											3a Letter not returned
267	Triade Development Corp. 3664 College Ave. San Diego, Calif.				x		x					Crankcase Valve	3d Questionnaire not returned. 3f Patent 3,088,447

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE NONE a	 NONDEVELOPER b	 DEVELOPER c	DECLINED WILL PARTICIPATE d	 QUESTIONNAIRE REC'D e	 HARDWARE EXISTS f	 HARDWARE REC'D g	 HARDWARE TESTED h	 IDENTIFIED OTHER SOURCES i	4 HARDWARE TYPE CLASS NO. a	 DEVICE NAME b	5 COMMENTS
268	Delta Products, Inc. 630 S. 7th St. Grand Junction, Colo. 81501 Tel (303) 242-9000				x	x	x	x			1.3.2	Capacitive Discharge Ignition	
269	U.N. Schultz 12429 Huntington Dr. Pasadena, Calif.	x											3a Letter not returned
270	Phillips Applied Research 1640 21st St. Santa Monica, Calif. 90404	x											3a Letter not returned
271	Econo Smog Control Inc. Odessa, Tex.	x											3a Letter returned unopened; left no address
272	Research Fuels Inc. 1495 Kingston St. Aurora, Colo.	x											3a Letter returned unopened; left no address
273	Sciap Association 1532 Piaza Bldg. Wichita, Kans.	x										Catalytic Afterburner	3a Letter not returned. Patent 3,220,179
274	C. Eugene Miller Professor of Environmental & Biomedical Engineering University of Louisville Louisville, Ky. 40208	x											3a Letter not returned
275	Pneumetrics Inc. 19338 Hondelires St. North Ridge, Calif.	x											3a Letter not returned
276	Exhaust Controls Inc. 429 Delaney St. Newark, N.J. 07105 Tel (201) 344-6484			x									3c Refer to File No. 292
277	Universal Products Inc. 1427 Slocum St. Dallas, Tex. 75207	x											3a Letter not returned
278	Pedersen Enterprises P.O. Box 528 Farmington, Ma. 04938 Tel 778-3850				x		x					Pedersen Exhaust Gas Treatment System	3c Unable to participate at this time. Patent 3,545,201
279	Saranga Research Center, Inc. South Delsea Drive, R. D. #2 Millville, New Jersey 08332 Tel (609) 825-8556				x	x	x	x			1.4.3	Fuel Conditioner	

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE (DECLINED) NONE	NONDEVELOPER	DEVELOPER	WILL PARTICIPATE	QUESTIONNAIRE REC'D	HARDWARE EXISTS	HARDWARE REC'D	HARDWARE TESTED	IDENTIFIED OTHER SOURCES	4 HARDWARE TYPE CLASS NO.	DEVICE NAME	5 COMMENTS
		a	b	c	d	e	f	g	h	i	a	b	
280	Aerospace Corp. Director of Pollution and Resources 2350 S. El Segundo Blvd. Los Angeles, Calif.	x											3a Letter not returned
281	Harry Reid Prgs. Auto Lube Company 4159 Buena Vista, Suite 7 Dallas, Tex. 75204	x											3a Letter not returned
282	J&S Carb. Co. P.O. Box 10391 Dallas, Tex. 75207				x	x	x	x			1.4.2	LP Gas Injection	
283	R.L. McKinley 201 Fenton Rd. Longreen, Tex.			x								Steam Power Unit	3a Not a retrofit device
284	Filteron International 2322 Irving Blvd. Dallas, Tex. 75207	x											3a Letter not returned
285	Swanson Engineering & Manufacturing Company 1133 E. Redondo Blvd. Inglewood, Calif.	x											3a Letter not returned
286	Motor Equipment Mfg. Assn. MEMA Building 304 W. 58th St. New York, N.Y. 10019	x											3a Letter not returned
287	Automotive Service Industry Association 230 N. Michigan Ave. Chicago, Ill. 60601	x											3a Letter not returned
288	Conrad A. Bodai, PhD Environmental Scientific Assn. 319 San Miguel Dr. Arcadia, Calif. 91006 Tel (213) 445-1263				x	x	x	x	x		1.2.4	Carburetor Main Discharge Nozzle Modification	
289	Maremont Marketing Inc. 168 N. Michigan Ave. Chicago, Ill. 60601 Tel (312) 263-7676				x								3d Unable to participate at this time
290	John De Paolo 721 Filbert St. San Francisco, Calif.	x											3a Addressee unknown, Letter returned unopened. P.O. Box 2039, Yountville, Calif.

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE a NONE	DECLINED b NONDEVELOPER	c DEVELOPER	d WILL PARTICIPATE	e QUESTIONNAIRE REC'D	f HARDWARE EXISTS	g HARDWARE REC'D	h HARDWARE TESTED	i IDENTIFIED OTHER SOURCES	4 HARDWARE TYPE a CLASS NO.	b DEVICE NAME	5 COMMENTS
291	Eaton, Yale, and Towne Inc. Research Development Lab. 1000 Rust St. Saginaw, Mich. 48601	x											3a Letter not returned
292	Engelhard Minerals & Chemical Corporation Englehard Industries Division 429 Delaney St. Newark, N.J. 07105				x		x				1.1.1	Catalytic Converter	3d Questionnaire not returned. 3f Patent 3,197,955. Evaluation based on EPA Test Report 71-13.
293	Key Research Company P.O. Box 226 Nottingham, Pa. 19362	x					x					Power Jector	3a Letter not returned
294	Energy Transmission Corp. Subsidiary of Doughboy Ind, Inc. 2360 Cabrera San Bernardino, Calif.	x									1.2.2	Exhaust Gas Recirculation with Carburetor Modification	3a Letter not returned
295	Pollution Controls Industries, Incorporated 2207 Border Ave. Torrance, Calif. 90501				x	x	x	x	x		1.2.4	Carburetor with Variable Venturi	
296	A.S. Manceri Controlled Ignition Electronics 9446 Borson St. Downey, Calif.				x	x	x				1.3.2	Ignition Timing and Spark Modification	3f Photograph received
297	Dr. S.J. Carter 14902 Purdy Ave. Midway City, Calif. 92655 Tel 894-3456	x											3a Letter not returned
298	D.D. Sanford P.O. Box 802 Oakland, Calif. 94604	x											3a Letter not returned
299	Mr. C.T. Carnes U.S. Carburetor & Mfg. Co. 939 - 4th St. Hollister, Calif. 95023	x											3a Letter not returned
300	Lois King Engineering 2901 E. Pierson Phoenix, Ariz.	x					x					Deceleration Valve Exchange Brake	3a Letter not returned
301	Mr. J.O. Hartsell Randsburg, Calif.	x										Exchange Condenser	3a Letter not returned
302	Mr. J. Hull 44954 - 3rd St., E. Lancaster, Calif. 93534			x									3c Letter returned unopened. Not prepared to participate - Telecon.

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE a NONE	b NONDEVELOPER	c DEVELOPER	d WILL PARTICIPATE	e QUESTIONNAIRE REC'D	f HARDWARE EXISTS	g HARDWARE REC'D	h HARDWARE TESTED	i IDENTIFIED OTHER SOURCES	4 HARDWARE TYPE a CLASS NO.	b DEVICE NAME	5 COMMENTS
303	Preventive Maintenance Co. 864 Burlway Rd. Burlingame, Calif. 94010	x										Fuel Additive	3a Letter not returned
304	Metal Units, Inc. 4130 Mennes St. Riverside, Calif. 92509				x							Dual Fuel	3a Questionnaire not returned
305	Mr. E. B. McWhirter 2619 E. Victor Hugo Ave. Phoenix, Ariz. 85032 Tel (620) 947-8371				x		x					Air Injection Pump	3d No further information received. 3e Patent 3,401,518
306	Power Replacements, Inc. 1306 Logan Ave. Costa Mesa, Calif.	x										Additive	3a Letter not returned
307	Mr. F. M. Johnson 821 Centinela Ave. Inglewood, Calif. 90302	x										Exchange Absorb	3a Letter not returned
308	Mr. Ernest A. Eastman Box 73, Smith St. Sedona, Ariz. 86336 Tel (602) 282-3540			x	x	x	x				1.1.3	Exhaust Gas Afterburner	3f Photographs taken. Patent 3,304,711
309	Mr. John H. White 6494 Leonard Dr. Redding, Calif. 96001	x					x						3a Letter not returned. 3f Patent 3,383,854
310	Mr. Jess Birdwell 5476 Linden Ave. #7 Long Beach, Calif. 90805	x					x						3a Letter not returned. 3f Patent 3,372,540
311	Mr. Paul Ketzer 191 Rue De La Courcelles #17 Paris, France	x					x						3a Letter not returned. 3f Patent 3,370,419
312	Mr. Brooks Walker 1280 Columbus Ave. San Francisco, Calif. 94133				x		x					Exhaust Treatment	3d Unable to complete questionnaire at this time. 3f Patents 3,368,345, 3,282,046, 3,162,184, 3,265,373, 3,338,111, 3,346,243, 3,363,886, 3,456,633, 3,507,260.
313	H. D. Bowman Company P.O. Box 735 Raleigh, N.C. 27602 Tel (919) 834-1878				x		x					Exhaust Filters	3d Questionnaire not returned. 3f Patents 3,224,171 and 3,350,877

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE (DECLINED) a NONE	b NONDEVELOPER	c DEVELOPER	d ' PARTICIPATE	e QUESTIONNAIRE REC'D	f HARDWARE EXISTS	g HARDWARE REC'D	h HARDWARE TESTED	i IDENTIFIED OTHER SOURCES	4 HARDWARE TYPE a CLASS NO.	b DEVICE NAME	5 COMMENTS
314	Albano Enterprises Inc. DBA Air-Jet Manufacturing 1570 E. Edinger, Suite G Santa Ana, Calif. 92705 Tel (714) 835-9177				x		x					Crankcase Ventilation System	3d Questionnaire not returned
315	Nycal Co., Inc. 700 Washington Ave. Carlstadt, N.J. 07072				x	x	x	x			2.1	Closed Blowby Control System	3g Photographs taken. 3f Patent 3,495,578
316	Gerlach Emprise Product 723 E. Proyidencia Ave. Burbank, C lif. Tel 842-5317				x		x					Auto Exhaust Homogenizer	3d Questionnaire not returned. 3f Patent 3,279,168
317	Automotive Exhaust Control Corporation 2824 - 51st St., South St. Petersburg, Fla. 33707 Tel (813) 341-6462				x	x	x	x			1.2.4	Carburetor Modification with Vacuum Advance Disconnect	3f Photograph taken
318	Mr. A. S. Chan 16227 Soriano Dr. Hacienda Heights, Calif. 91745	x											3a Letter not returned
319	Wilko Machine, Inc. 2313 N. San Fernando Blvd. Burbank, Calif. 91504	x										PRD Carburetor and Muffler System	3a Letter not returned
320	Devcom Associates 1885 Kashlan Rd. La Habra, Calif. 90631	x										H_2O Exchange Filter	3a Letter not returned
321	Mr. H. P. Rock 5034 Del Rio Salt Lake City, Utah 84117	x											3a Letter not returned
322	Mr. E. O. Wilford 300 Linden Ave. Merion Station, Pa. 19066	x					x				1.1.5	Exhaust Gas Back-pressure Valve	3a Letter not returned. Evaluation based on HEW/NAPCA Report 71-9.
323	Mr. D. Casul 2459 Cardinal Way Salt Lake City, Utah 84121	x										Daul Carburetor Small	3a Verbal negative reply
324	B-Z Disposal Service 5230 N. Clark Ave. Lakewood, Calif. 90712	x					x					Muffler	3a Letter not returned
325	Servi-Tech, Inc. A Division of Silvex Industries 122 Navajo St. Salt Lake City, Utah 84104				x	x	x	x			1.2.1	Air-Vapor Bleed to Intake Manifold	3g Photographs taken

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE	DECLINED								4 HARDWARE TYPE		5 COMMENTS
		NONE	NONDEVELOPER	DEVELOPER	WILL PARTICIPATE	QUESTIONNAIRE REC'D	HARDWARE EXISTS	HARDWARE REC'D	HARDWARE TESTED	IDENTIFIED OTHER SOURCES	CLASS NO.	DEVICE NAME	
		a	b	c	d	e	f	g	h	i	a	b	
326	Mr. George A. Bomba 100 Adelaide St. Concord, Calif. 94520				x							Thermal Reactor	3d Questionnaire not returned
327	International Air Pollution Control Ltd. 14th Ave., S.W. Calgary 3, Alberto, Canada	x										Muffler Catalyst	3a Letter returned unopened (address incomplete)
328	T.R.E.C. Development 2576 Highland Blvd. Nanaimo, British Columbia, Canada	x										Thermal Reactor	3a Letter returned unopened (address unknown)
329	J&S Automotive Service 736 "F" St. Chula Vista, Calif. 92010	x										Air Injector Exchange	3a Letter not returned
330	Grant Industries, Inc. 3680 Beverly Blvd. Los Angeles, Calif. 90004	x											3a Letter not returned
331	Same as File No. 330												
332	Mutual Industries, Inc. Worcester, Mass.	x										Anti-Smog Device	3a Letter not returned. Patents 3,354,635 and 3,415,055
333	Eunice F. Lambert 65 W. Encanto Blvd. Phoenix, Ariz. 85003	x										CO_2 Burner Muffler	3a Letter not returned. Patent 3,350,878
334	Hanskarl Leistritz 49 Reichenhaller Str. 8228 Freilassing, Germany	x										Afterburner	3a Letter not returned. Patent 3,347,040
335	Mr. Joel B. Guin 148 E. 48th St. New York, N.Y. 10017	x										Exhaust Purifier	3a Letter not returned. Patent 3,331,201
336	Mr. Albert Vanderpoel 14509 Van Ness Ave. Gardena, Calif. 90249	x										Exhaust Manifold Afterburner	3a Letter not returned. Patent 3,314,230
337	Mr. Clarence Boyd 5325 Belt Rd., N.W. Washingtin, D.C. 20015	x										Exhaust Purification Method and Apparatus	3a Letter not returned. Patent 3,306,034
338	Mr. Jack C. Morrell 8 Oxford St. Chevy Chase, Md. 20015	x										Emission Control	3a Letter not returned. Patent 3,306,035
339	Mr. Edward R. Knopp 7884 Wyandot St. Denver, Colo. 80221	x										Anti-Smog Device	3a Letter not returned. Patent 3,300,964

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 DECLINED RESPONSE									4 HARDWARE TYPE		5 COMMENTS
		a NONE	b NONDEVELOPER	c DEVELOPER	d WILL PARTICIPATE	e QUESTIONNAIRE REC'D	f HARDWARE EXISTS	g HARDWARE REC'D	h HARDWARE TESTED	i IDENTIFIED OTHER SOURCES	a CLASS NO.	b DEVICE NAME	
340	Mr. Josef Ernst Hardenbergstrasse 14 Hagen, Germany	x										Exhaust Decontamination	3a Letter not returned. Patent 3,290,876
341	Mr. Charles W. Morris 11769 Chenault St. Los Angeles, Calif. 90049	x										Exhaust Control System	3a Letter not returned. Patents 3,287,899, 3,581,490, 3,209,531, 3,209,532
342	Joseph Lucas, Ltd. Great King St. Birmingham, B19 3XF, England				x		x					1. Patrol Injection System 2. Ignition System 3. Pumps 4. Recirculation Valves	3a Questionnaire not returned. Patent 3,287,900
343	Mr. Gary W. Wright 2317 Kimridge Rd. Beverly Hills, Calif.	x										Antismog Afterburner	3a Letter not returned. Patent 3,276,202
344	Mr. Carter Weils 1962 N. Prospect Ave. Milwaukee, Wis.	x										Exhaust Aid	3a Letter not returned. Patent 3,253,041
345	Socony Mobile Oil Co., Inc. New York, N.Y.	x										Afterburner	3a Letter not returned. Patent 3,228,185
346	Mr. Walter D. Maring Shelby, Ind.	x											3a Letter not returned. Patent 3,214,902.
347	Mr. Horace V. Littell 1429 Wedgewood Drive Anaheim, Calif.	x										Anti-Pollutant Device	3a Letter not returned. Patent 3,213,608
348	Donaldson Company, Inc. Minneapolis, Minn.	x										Afterburner	3a Letter not returned. Patent 3,201,933
349	Mr. John Dolza 810 State St. Fenton, Mich.	x											3a Letter not returned. Patents 3,201,933 and 3,192,706
350	Mr. James J. Dolfi, Sr. 2750 Arlington Ave. #F Torrance, Calif.				x		x					1. Vac-Tronic Spoiler 2. Gas Purifier	3d Questionnaire not returned. 3f Patent 3,186,164
351	Mr. Robert B. Heller 1111 Loxford Terrace Silver Spring, Md.	x										Exhaust Emission	3a Letter not returned. Patent 3,180,083
352	Firma J. Eberspacher Esslingen (Neckar) Germany			x			x					Exhaust Detoxicator	3c New car installation. 3f Patent 3,174,277

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE DECLINED									4 HARDWARE TYPE		5 COMMENTS
		a NONE	b NONDEVELOPER	c DEVELOPER	d WILL PARTICIPATE	e QUESTIONNAIRE REC'D	f HARDWARE EXISTS	g HARDWARE REC'D	h HARDWARE TESTED	i IDENTIFIED OTHER SOURCES	a CLASS NO.	b DEVICE NAME	
353	Minnesota Mining & Manufacturing Company St. Paul, Minn.	x										Afterburner	3a Letter not returned. Patent 3,172,251
354	Honda Giken Kogyo Kabushiki Kaisha Toyko, Japan	x											3a Letter not returned. Patent 3,590,578
355	Suzuki Jidosha Kogyo Kabushiki Kaminura Hamana-Gun, Japan	x											3a Letter not returned. Patent 3,590,579
356	Herman P. Roth General Scientific Lab. Manhatton Beach, Calif.	x											3a Letter not returned
357	Dow Chemical Company Midland, Mich.	x											3a Letter not returned. Patent 3,563,029
358	Tenneco, Inc. Houston, Tex.	x											3a Letter not returned. Patent 3,563,030
359	Southwick W. Briggs 6240 Western Ave. Chevy Chase, Md. 20015	x											3a Letter not returned. Patents 3,568,437 and 3,520,131
360	Standard-Triumph Motor Co., Ltd Canley, Coventry, England	x											3a Letter not returned. Patent 3,537,257
361	Mr. John Kaufmann, Jr. 3716 Woodrow Ave. Pittsburgh, Pa. 15227	x											3a Letter not returned. Patent 3,543,510
362	Sanitized A. G. Burgdorf Berne, Switzerland	x											3a Letter not returned. Patent 3,534,547
363	Mr. Joseph W. McKee Route 1, Box 292 Broomfield, Colo. 80020	x											3a Letter not returned. Patent 3,524,316
364	Godfrey Precision Pro., Ltd. Godfrey House Hampton Road West West Hanworth Middlesex, England		x										3b Patent 3,498,054
365	Genaro G. Celayan 3171/2 N. Beaudry Ave. Los Angeles, Calif. 90012	x											3a Letter not returned. Patent 3,499,282
366	Porsche K. G. Stuttpart-Zuffenhausen Germany	x											3a Letter not returned. Patent 3,491,533

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE (DECLINED) NONE a	NONDEVELOPER b	DEVELOPER c	WILL PARTICIPATE d	QUESTIONNAIRE REC'D e	HARDWARE EXISTS f	HARDWARE REC'D g	HARDWARE TESTED h	IDENTIFIED OTHER SOURCES i	4 HARDWARE TYPE CLASS NO. a	DEVICE NAME b	5 COMMENTS
367	Robert A. Rando and James J. Rando 107 N. Chelsea Ave. Atlantic City, N.J. 08401	x											3a Letter not returned. 3f Patent 3,482,395
368	Bruno Bettega 179 Franklin St. Northvale, N.J. 07647	x											3a Letter not returned. 3f Patent 3,477,227
369	Mr. George R. Stevens 291 River Rd. Bogota, N.J. 07603	x											3a Letter not returned. 3f Patent 3,477,227
370	Borg-Warner Corporation 200 S. Michigan Ave. Chicago, Ill. 60604				x		x						3e Will participate through their Marvel Schebler Division File No. 60 3f Patent 3,479,816
371	Gerald L. Schnurmacher 319 Bonita Ve. Piedmont, Calif. 94611				x							Exhaust System	3d Questionnaire not received. Patent 3,462,946
372	Mykola Hraboweckyj 12312 Beech Daly Rd. Taylor, Mich. 48180				x							Exhaust System	3d Questionnaire not received. Patent 3,468,124
373	Mr. Frank Gurr Salt Lake City, Utah	x											3a Letter not returned. Patent 3,470,689
374	Ietatsu Okno 1667-2-406 Mure, Mitaka Tokyo, Japan	x											3a Letter not returned. Patent 3,446,011
375	Nippon Denso Kabushike Kaisha Kariyashi, Aichiki-Ken Japan	x											3a Letter not returned. Patent 3,455,105
376	Mr. Louis Anderson Gotgatan 73 Stockholm, Sweden	x											3a Letter not returned. Patent 3,444,687
377	Katashi Aoi 480 Juniso, Kamakura-Shi Kanagawa-Ken, Japan	x											3a Letter not returned. Patent 3,421,315
378	Kockums Mekaniska Verkstads Artiebolag Malmo, Sweden	x											3a Letter not returned. Patent 3,426,526

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE									4 HARDWARE TYPE		5 COMMENTS
			DECLINED								CLASS NO.	DEVICE NAME	
		NONE	NONDEVELOPER	DEVELOPER	WILL PARTICIPATE	QUESTIONNAIRE REC'D	HARDWARE EXISTS	HARDWARE REC'D	HARDWARE TESTED	IDENTIFIED OTHER SOURCES			
		a	b	c	d	e	f	g	h	i	a	b	
379	Bernhard Max Schongs Stapelfelderstrasse 34A Hamburg, Germany	x											3a Letter returned unopened - Insufficient address. Patent 3,413,804
380	Hans Waldemar Lau Laurenburgerstrasse 9 Hamburg, Germany	x											3a Letter not returned. Patent 3,413,804
381	Jurgen Behrans Schulstrasse 23 Breitenfelde, Germany	x											3a Letter not returned. Patent 3,413,804
382	Mr. John Farrell 5320 Beverly Hills Ln. Houston, Tex. 77027	x											3a Letter not returned. Patent 3,415,056
383	Fran Corporation 105 Pawtucket Ave. East Providence, R.I. 02916	x											3a Letter not returned
384	Hydro-Catalyst Corp. 60 E. 42nd St. New York, N.Y. 10017 Tel (201) 946-4195				x	x	x	x			1.2.3	Air-Fuel Mixture Diffuser	3d Insufficient time to evaluate
385	Oil Technology Corp. 99 E. Hawthorne Ave. Valley Stream, N.Y. 1'580	x											3a Letter not returned
386	Mr. Martin B. Pearlman 78-05 - 141st St. Flushing, N.Y. 11367				x		x					Nophume Muffler Device	3d Questionnaire not returned. Patent 3,142,150
387	Dopp Systems, Inc. 157-12 Willets Point Blvd. Whitestone, N.Y. 11357	x										Dopp Smog Reducer	3a Letter not returned
388	Associated Consultants, Inc. P.O. Box 64612 Baton Rouge, La. 70806	x											3a Letter not returned
389	Automotive Emission Control Suite 104 Atkinson Square Louisville, Ky. 40218	x											3a Letter not returned
390	Morgan Firestone Iroquois Shore Rd. Oakville, Ontario, Canada	x											3a Letter not returned
391	Dart Industries 8480 Beverly Blvd. Los Angeles, Calif. 90054	x											3a Letter not returned

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE									4 HARDWARE TYPE		5 COMMENTS
			DECLINED								CLASS NO.	DEVICE NAME	
		NONE	NONDEVELOPER	DEVELOPER	WILL PARTICIPATE	QUESTIONNAIRE REC'D	HARDWARE EXISTS	HARDWARE REC'D	HARDWARE TESTED	IDENTIFIED OTHER SOURCES			
		a	b	c	d	e	f	g	h	i	a	b	
392	Mr. Jack F. Damaree P.O. Box 201 Georgetown, Tex. 78626	x											3a Letter not returned
393	Environmental Control Systems Corporation 1335 King Ave. Columbus, Ohio 43212				x								3d Questionnaire not returned
394	H. M. Laboratories Inc. Sta-Power Division 56 Harbor St. San Rafael, Calif. 94901	x											3a Letter not returned
395	Otis Elevator Company 8000 Baker Ave. Cleveland, Ohio 44102	x										Exhaust System	3a Letter not returned
396	Aquanautics, Inc. Acquair Division 225 Mt. Hamilton Ave. Los Altos, Calif. 94022	x											3a Letter not returned
397	American Lecithin Company P.O. Box 4056 Atlanta, Ga. 30302	x											3a Letter not returned
398	Exhaust Control Mfg. Corp. 2905 - 47th Ave. North St. Petersburg, Fla. 33714	x											3a Letter not returned
399	Southern Pollution Controls, Incorporated 2607 Leeman Ferry Rd. Huntsville, Ala. 35801	x											3a Letter not returned
400	Sierra Scientific Corp. 625 S. Wells Ave. Reno, Nev. 89502			x									3a Chose not to advertise device
401	Turbo Injector Sales Suite 203, Executive Bldg. 115 S. 17th St. Paducah, Ky. 42001				x						1.2.1	Air-Vapor Bleed to Intake Manifold	3d Interested - Questionnaire not returned. Evaluation based on miscellaneous data.
402	University Resources Inc. 115 Suffolk Rd. Wellesley Hills, Mass. 02181	x											3a Letter not returned
403	Victor Equipment Company P.O. Drawer 1007 Denton, Tex. 76201	x											3a Letter not returned

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE			DECLINED						4 HARDWARE TYPE		5 COMMENTS
		NONE	NONDEVELOPER	DEVELOPER	WILL PARTICIPATE	QUESTIONNAIRE REC'D	HARDWARE EXISTS	HARDWARE REC'D	HARDWARE TESTED	IDENTIFIED OTHER SOURCES	CLASS NO.	DEVICE NAME	
		a	b	c	d	e	f	g	h	i	a	b	
404	Micro Mist Corporation 33 Milford Dr. Hudson, Ohio 44236 Tel (216) 653-8831				x		x						3c Unable to participate at this time. 3f Patent 3,326,538
405	Refer to File No. 36												
406	Grayiano Gas Saving Device, Inc. 422 W. Alosta Blvd. Glendora, Calif. 91740 Tel 963-6371				x		x					Cylindrical Diffusion Element	3d Questionnaire not returned. 3f Patent 3,583,377
407	Bob R. Wittington 1002 N. Canal St. P.O. Drawer 370 Carlsbad, N.M. 88220	x											3a Letter not returned
408	Riverside Auto Repair 4170 Soto St. Riverside, Calif.				x	x	x	x			4.0	Exhaust Gas and Blowby Recirculation with Intake Vacuum Control and Turbulent Mixing	3g Photographs taken
409	Clyde Randolph Jones 37-B Calle Aragon Laguna Hills, Calif. 92653 Tel (714) 837-1816				x								3c Unable to participate at this time
410	W. A. Dennis 514 W. Bay Ave. Balboa, Calif.	x											3a Letter returned unopened - Moved, left no address.
411	U.S. Department of Commerce Advisor on Environmental Quality Room 5611 Washington, D.C. 20236	x											3a Letter not returned
412	American Society of Mechanical Engineering 1916 Race St. Philadelphia, Pa.	x											3a Letter not returned
413	Arthur D. Little Cambridge, Mass.	x											3a Letter not returned
414	Environmental Science and Technology 1155 Sixteenth St., N.W. Washington, D.C. 20036 Tel (202) 737-3337		x										
415	Louis W. Milos 152 Mahar Ave. Clifton, N.J. 07011	x										Engine Exhaust System	3a Letter not returned. Patent 3,396,535

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE: a NONE	b NONDEVELOPER	c DEVELOPER	d WILL PARTICIPATE	e QUESTIONNAIRE REC'D	f HARDWARE EXISTS	g HARDWARE REC'D	h HARDWARE TESTED	i IDENTIFIED OTHER SOURCES	4 HARDWARE TYPE: a CLASS NO.	b DEVICE NAME	5 COMMENTS
416	Edward Haas 93 Darnacherstrasse Basel, Switzerland	x										Exhaust Gas Treating Device	3a Letter not returned. Patent 3,392,522
417	Mr. Yuma K. Kretschmer Farrar, Ga.	x										Exhaust Gas Treatment	3a Letter returned unopened; address unknown. Patent 3,595,015
418	Energy Sciences, Inc. 343 Coral Circle El Segundo, Calif. 90245 Tel (213) 322-6368	x									1.2.1	Air Bleed to Intake Manifold	3a Letter not returned. Evaluation based on EPA Test Report 71-25.
419	Allied Management Consultants 2383 Pruneridge Ave. Santa Clara, Calif. 95050 Tel (408) 243-8310				x								3d Questionnaire not returned
420	Vapor Injector, Inc. Bargerville, Ind. 46106 Tel (717) 761-4271	x										Vapor Injector	3f Letter not returned
421	Cyril J. Telank-Combustion Air Pollution Con. 149 Amberston Dr. Williamswille, N.Y. 14221	x										Combustion Device	3a Letter not returned
422	Sierra Distributors P.O. Box 266 Bloomingburg, N.Y. 12721	x										Crankcase Emission Control Unit	3a Letter not returned
423	Denecon Corporation P.O. Box 114 Middletown, N.J. 07748				x		x					Automotive Antipollution Device	3c Unable to participate at this time
424	Mr. Thomas J. Hoy 839 S. 13th St. Newark, N.J. 07108		x										
425	Clean Environment, Inc. 3445 38th St., N.W. Washington, D.C. 20016				x	x	x				1.1.3	Exhaust Gas Afterburner	3e Unable to participate at this time. 3f Patent 3,601,982
426	Dr. Cornell Grossman 46 Old Short Hills Rd. Short Hills, N.J. 07078	x											3a Letter nor received
427	Kar Products, Inc. 461 N. 3rd Ave. Des Plaines, Ill. 60016				x	x	x	x			2.1 2.2	Closed or Open Blowby Control System with Filter	3g Photographs taken
428	Natural Gas Vehicles, Inc. Washington, D.C.	x										CNG Conversion	3a Letter returned unopened (insufficient address).

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 DECLINED RESPONSE									4 HARDWARE TYPE		5 COMMENTS
		NONE	NONDEVELOPER	DEVELOPER	WILL PARTICIPATE	QUESTIONNAIRE REC'D	HARDWARE EXISTS	HARDWARE REC'D	HARDWARE TESTED	IDENTIFIED OTHER SOURCES	CLASS NO.	DEVICE NAME	
		a	b	c	d	e	f	g	h	i	a	b	
429	Trans-World Marketing, Inc. P.O. Box 165 Bountiful, Utah 84010 Tel (801) 292-1437				x		x					Econo-Needles	3d Questionnaire not returned. 3f Emission test data not received.
430	Richard Kolb 540 Princeton St. New Milford, N.J.				x	x	x				1.2.3	Induction Modification	3e Photographs received
431	Dawnard Corporation 70 Glenn Way Belmont, Calif.	x											3e Letter not returned
432	Billvined Mufflers, Inc. John M. Running, Attorney 920 Kinderkamack Rd. River Edge, N.J. 07661				x		x					Muffler Modification	3d Questionnaire not returned. 3f Patent 3,066,755
433	Auto Pollution Control Corp. P.O. Box 392 Gresham, Ore. 97030				x	x	x	x			1.2.1	Air-Vapor Bleed to Intake Manifold	3g Photographs taken. 3e Data received in lieu of questionnaire.
434	Cleman Enterprises 13256 Northrop Way Belleview, Wash. 98004	x											3a Letter returned unopened (incomplete address).
435	Innova Inc. Nanaimo System 44 Ravenna Blvd. Seattle, Wash. 98115				x							Flame Afterburner	3d Unable to participate at this time
436	National Inventors Council Washington, D.C. 20231	x											3a Letter not received
437	American Society of Inventors P.O. Box 122 Marion Station Philadelphia, Pa. 19066	x											3a Letter not received
438	International Inventors Registrar 1157 S. Beverly Dr. Los Angeles, Calif. 90035		x										
439	Mr. Joel Hill 371 W. O'Connor St. E. Palo Alto, Calif. 94303				x		x					Electronic Ignition System	3d Questionnaire not returned
440	Mr. F. O. Wiseman Route 8, Box 431 Chambersburg, Pa. 17201				x	x	x				1.2.3	Air-Fuel Mixture Deflection Plate	3d Participating. 3f Insufficient emissions data to evaluate device for test. Patent 3,393,984

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE a NONE	DECLINED b NONDEVELOPER	c DEVELOPER	d WILL PARTICIPATE	e QUESTIONNAIRE REC'D	f HARDWARE EXISTS	g HARDWARE REC'D	h HARDWARE TESTED	i IDENTIFIED OTHER SOURCES	4 HARDWARE TYPE CLASS NO. a	DEVICE NAME b	5 COMMENTS
441	Automatic Systems 1007 E. 10th St. Fairmont, Minn.			x									3c Unable to participate at this time
442	Laser Nucleonics, Inc. 123 Moody St. Waltham, Mass. 02154 Tel (617) 891-7880				x		x					Spark Plug	3d Questionnaire not returned
443	Mr. John de Rageris 695 Kenneth Ave. Campbell, Calif. 95808	x											3a Letter not returned
444	Mr. Cyril J. Telack 149 Amherston Dr. Williamsville, N.Y. 14221 Tel (716) 634-2623				x								3a Questionnaire not returned
445	Systron Donner 4101 Wayside Ln. Carmichael, Calif. 95608	x											3a Letter not returned
446	M. E. Grey and Associates 914 Roses Rd. San Gabriel, Calif. 91775	x											3a Letter not returned
447	Mr. John Marois 4317 Orange Ave. San Diego, Calif. 92801	x											3a Questionnaire not returned
448	Mr. J. T. Webster 2436 Green Leaf Anaheim, Calif. 92801	x											3a Questionnaire not returned
449	Refer to File No. 259												
450	Owens-Corning Fiberglass Corporation Newark, N.J.	x										Catalytic Exhaust Treatment	3a Letter returned unopened (Addressee unknown). Patent 3,166,895
451	Mr. Sidney B. Wertheimer 7403 Woodmar Ave. Hammond, Ind.	x										Exhaust Purifier	3a Letter returned unopened (no forwarding address). Patent 3,[illegible]2,047
452	Mr. Willard R. Calvert 306 Glenlock Rd. Ridley Park, Pa.											Exhaust Gas Converter	3a Letter returned unopened (moved, not forwardable). Patent 3,176,461

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 DECLINED RESPONSE									4 HARDWARE TYPE		5 COMMENTS
		NONE	NONDEVELOPER	DEVELOPER	WILL PARTICIPATE	QUESTIONNAIRE REC'D	HARDWARE EXISTS	HARDWARE REC'D	HARDWARE TESTED	IDENTIFIED OTHER SOURCES	CLASS NO.	DEVICE NAME	
		a	b	c	d	e	f	g	h	i	a	b	
453	Mr. Joseph S. Barlow 1957 Maiden Ln. Altadena, Calif.	x										Combustion Control	3a Letter returned unopened (moved, not forwardable). Patent 3,224,188
454	Mr. Eugene W. Hines 4292 Esta Dr. Flint, Mich.	x										Afterburner	3a Letter returned unopened (moved, not forwardable). Patent 3,285,002
455	Envirotech Corporation Salt Lake City, Utah	x											3a Letter returned unopened (insufficient address). Patent 3,466,868
456	Mr. Joe W. Von Brimer General Scientific Labs Inc. Sherman Oaks, Calif.	x											3a Letter returned unopened (insufficient address). Patent 3,577,728
457	Engine Accessories Manufacturing Company 5809 E. Beverly Blvd. Los Angeles, Calif. Tel (213) 723-4978	x		x			x				1.4.2	Water Injection	3a Evaluation based on APCA Project B-1-7-2 Report dated 1966.
458	Sky Corporation Stockton, Calif.	x		x			x				1.2.1	Air Bleed to Intake Manifold	3a Evaluation based on EPA Test Report 72-5
459	Marvel-Schebler Division Borg-Warner Corp. 2195 S. Elwen Rd. Decatur, Ill. 62525	x		x			x				1.4.1	LPG Conversion with Deceleration Unit	3a Evaluation based on HEW/NAPCA Test Report 71-8.
460	Pacific Lighting Service Co. 720 S. Flower St. Los Angeles, Calif. 90054	x		x			x				1.4.1	Compressed Natural Gas Dual-Fuel Conversion	3a Evaluation based on EPA Test Report 71-17
461	Refer to EPA Test Report 71-21	x		x			x				1.4.1	LPG Conversion with Exhaust Reactor Pulse Air Injection and Exhaust Gas Recirculation	3a Evaluation based on EPA Test Report 71-21
462	Automotive Emissions Control Corp. (AEC) Louisville, Ky.	x		x			x				1.2.1	Air Bleed to Intake and Exhaust Manifolds	3a Evaluation based on EPA Test Report 72-1
463	Esso Research and Eng. Co. P.O. Box 111 Linden, N.J. 07036	x		x			x				1.1.2	Rich Thermal Reactor with Exhaust Gas Recirculation and Spark Retard	3a Evaluation based on EPA Test Report 72-3 and SAE Paper 710608

1 DEVICE AND/OR FILE NO.	2 DEVELOPMENT SOURCE	3 RESPONSE									4 HARDWARE TYPE		5 COMMENTS
		DECLINED											
		NONE	NONDEVELOPER	DEVELOPER	WILL PARTICIPATE	QUESTIONNAIRE REC'D	HARDWARE EXISTS	HARDWARE REC'D	HARDWARE TESTED	IDENTIFIED OTHER SOURCES	CLASS NO.	DEVICE NAME	
		a	b	c	d	e	f	g	h	i	a	b	
464	Refer to EPA Test Report 72-4	x		x			x				1.4.1	Methanol Fuel Conversion with Catalytic Converter	3a Evaluation based on EPA Test Report 72-4
465	Refer to EPA Test Report 71-24	x		x			x				1.4.2	Fuel Additive	3a Evaluation based on EPA Test Report 71-24
466	Algas Industries 2657 Andjou Ave. Dallas, Tex. 75220	x		x			x				1.4.1	LPG-Gasoline Dual-Fuel Conversion	3a Evaluation based on HEW/NAPCA Test Report 71-1
467	Production System(1)	x									3.0	Fuel Evaporation Control System	3a Review of production system only
468	Ethyl Corporation 100 Park Ave. New York, N.Y. 10017	x		x			x				1.1.2	Lean Thermal Reactor with Exhaust Gas Recirculation	3a Evaluation based on Aerospace Report TOR-0172(2787)-2
469	E.I. du Pont de Nemours & Co. (Refer to Device 244)			x			x				4.0	Rich Thermal Reactor with Exhaust Gas Recirculation and Particulate Control	3a Evaluation based on du Pont Paper A-72692, HEW/NAPCA Test Report 71-3 and report dated 5-70.

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(1) This device represents a fuel evaporation control system used on new model vehicles. The device was evaluated for retrofit cost feasibility.

APPENDIX V-2

INVENTORY OF RETROFIT SOURCE DATA FOR DEVICES EVALUATED IN RETROFIT PROGRAM

This appendix lists the principal items of data obtained from retrofit development sources for each of the devices evaluated in the retrofit program. A data inventory sheet is provided for each of these devices, as follows:

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NOTE: All data items listed on the following retrofit device data inventory sheets were provided by the retrofit source except those designated by asterisk; the latter were obtained from the data files of Olson Laboratories, Inc., or from the Environmental Protection Agency. Test reports provided by the Environmental Protection Agency are listed by author at the end of this appendix.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 1 - Air Bleed to Intake Manifold

*1. Olson Laboratories Test Report No. 231-1, "Emissions Test of an Adaks Vacuum Breaker System," 20 May 1971.

2. Adaks Products Incorporated Brochure, "Adaks Vacuum Breaker."

3. Installation Procedure, "Installation of the Adaks Vacuum Breaker," 25 May 1971.

4. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*5. Gompf, Henry L., "Exhaust Emissions from Two Passenger Vehicles Equipped with the ADAKS Device," Report 72-6, EPA Office of Air Programs, September 1971.

*6. Photograph No. BB041.

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INVENTORY OF RETROFIT SOURCE DATA

Device No. 10 - Throttle-Controlled Exhaust Gas Recirculation with Vacuum Advance Disconnect

1. Letters dated 17 July 1971 and 3 August 1971, addressed to the Air Resources Board, Subject "Northrop Report for the Test and Evaluation of the American Pollution Controlled, Inc. Exhaust Emission Control Device."

2. "Functional Description of American Pollution Controlled Pollution Control System for Used Cars."

3. System Description, "APC Exhaust Emission Control System."

4. "Application for State of California Accreditation of Exhaust Control System for Used Cars," 9 February 1971.

5. Progress Report, "Summary of Test Results," American Pollution Controlled, Inc.

*6. Northrop Report No. 71Y139, "Testing and Evaluation of the American Pollution Controlled, Inc. Exhaust Emission Control Device - Final Report," 2 July 1971.

*7. Photograph No. BB046.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 22 - Electronic Fuel Injection

*1. Thomson, John C., "Exhaust Emissions from a Passenger Automobile Equipped with Electronic Fuel Injection," Report 71-12, EPA Division of Motor Vehicle Research and Development, December 1970.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 23 - Electronic Ignition Unit

*1. Gompf, Henry L., "Exhaust Emissions from a Passenger Car Equipped with the Biap Electronic Ignition Unit," Report 71-7, HEW/NAPCA Division of Motor Vehicle Research and Development, September 1970.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 24 - Heavy Duty Positive Crankcase Control Valve with Air Bleed

*1. Gompf, Henry L., "Exhaust Emissions from a Passenger Car Equipped with Brisko's Heavy Duty PCV Valve," Report 71-20, EPA Division of Emission Control Technology, Air Pollution Control Office, February 1971.

2. Brochure, "Brisko's Power Booster PCV System."

3. Reprint from Super Service Station, "Anti-Pollutant System Brings Profits," November 1970.

4. Automotive Emissions test results comparing standard PCV system to Brisko's PC Valve, 26 August 1970.

5. Letter, F. Brisko to Olson Laboratories, Inc., 23 July 1971.

6. Letter, Technical Editor of Super Service Station Magazine to F. Brisko, 21 June 1971.

7. Letter, C. W. Schneider to Brisko Mileage Saver, Inc., 14 June 1971.

8. Letter, Pacific Lighting Service and Supply Company to F. Brisko, 15 June 1966.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 31 - Thermal Reaction by Turbine Blower Air Injection

1. Ulyate, J. R., "A New Air Supply System for Automotive Exhaust Emission Control," Chromalloy American Corporation, Advanced Products Division, performance and test results booklet.
2. Brochure, "The AMF Smog Burner TM."
3. Letter, Chromizing Company to Olson Laboratories, Inc., "Tests of Emission Control Devices for Retrofit on Used Cars," 6 August 1971.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 33 - Carburetor Modification, Main Jet Differential Pressure

1. Colspan Memorandum, "Colspan Automatic Mixture Control; Report of Preliminary Tests," 15 June 1971.
2. Automotive Testing Laboratories, Inc., "Hot Cycle Data, Test No. A-386," 12 July 1971.
3. Marvel-Schebler Division, Borg Warner Corp., "Exhaust Calculations, Test No. 53," 15 July 1971.
4. Marvel-Schebler Division, Borg Warner Corp., "Exhaust Calculations, Test No. 54," 15 July 1971.
5. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*6. Photograph No. BB034.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 36 - Fuel Conditioning by Exposure to Electromagnetic Field

*1. Caggiano, Michael A., "The Effect on Exhaust Emissions of the CETEC Atom-X Device," HEW/NAPCA Division of Motor Vehicle Pollution Control, Unnumbered Report, June 1970.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 42 - Air Bleed to Intake Manifold

*1. Olson Laboratories, Inc., Test Report, "Vehicle Exhaust Emission Test Report for Ferry Cap & Set Screw Co.," 17 January 1970.

2. Test Report No. 90704-58, 18 June 1970 and 22 July 1970.

*3. Olson Laboratories, Inc., Test Report, "Final Report for Wisconsin Mining Co., Ltd," 5 March 1970.

4. Installation Procedure, "PED Antipollution Device."

5. System Description, "PED Automobile Antipollution Device."

6. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*7. Photograph No. BB037.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 52 - LPG Conversion

1. Letter, 30 July 1971, from Herbert V. Hills, Executive Vice President, Impco, A Division of A. J. Industries, Inc., Cerritos, California 90701.
2. Miscellaneous sales brochures:
    a. Impco the Complete Design.
    b. Reprint of "Why a Top Builder of Race Cars Favors Propane," from Butane-Propane News, May 1971.
    c. "Impco First in Clean Air."
    d. Reprint of "Sewage Plant's Engines Operate Economically on Digester Gas," from Diesel and Gas Turbine Progress, October 1970.
    e. Reprint of "Your Car Will Run on LPG!" from Road Test, December 1969.
    f. Reprint of "Propane to Power a Police Fleet," from Butane-Propane News (Impco Form No. BAJ 2-70).
    g. Reprint of "LPG Passes Horsepower Test," from Road Test, April 1970 (Impco Form No. RT 4-70).
    h. Butane-Propane News, BPN 4-705M-Rev. 4 4-715M, December 1970.
    i. Special reprint of "Dual-Fuel Systems: How to Make the Conversion," from SP-GAS, May 1970 (Impco Form No. LP-G 5-70).
    j. Reprint of "Propane Fuel Passes Racing Test with Flying Colors," from Autoproducts, April 1971.
    k. "Diamond Reo Selects Impco for Heavy-Duty LPG Engines."
    l. "Impco Conquering Off-Road Racing."
    m. Reprint of "Water Pollution Makes a Market for LP-GAS," from Butane-Propane News, June 1970 (Impco Form No. BPN 770).
    n. Reprint of "Propane Powered Civil Defense Sirens are Dependable," from Public Works, November 1970 (Impco Form No. PW 2 11-70).
    o. "Impco Carburetion," Impco Form No. CA 70.
    p. Reprint of "Clean Up Your Act," from Stock Car Racing, July 1971 (No. SSR 771(5M)).

*3. Gompf, Henry L., "Exhaust Emissions from 10 GSA Rebels and 10 GSA Falcons Equipped with LPG Conversion Kits," Report 71-10, HEW/NAPCA Division of Motor Vehicle Research and Development, October 1970.

4. California Air Resources Board, "Emission Test on Three LP-GAS Vehicles," Project M 205, February 1970.

5. Impco Catalog of Emission Test Data on Material Handling Vehicle (Catalog File A).

6. Impco Catalog of Emission Test Data and California Air Resources Board Resolution accepting Impco LPG carburetors for Pre-1966 Vehicles (Catalog File B).

7. Impco Catalog of Component Descriptions and Prices (Catalog File C).

8. Impco Catalog of Emission Test Data and California Air Resources Board Resolutions accepting Impco LPG and CNG carburetors for 1966 and subsequent vehicles.

9. "Performance and Economy," LP-GAS Motor Fuel Manual (provided by Manchester Tank Company, Lynwood, California).

10. "Gas Power," the Fleet Owner's Gaseous Fuel Manual, a Publication of the Clean Air Car Project, California Institute of Technology, Environmental Quality Laboratory, 1 November 1971.

11. Miscellaneous data provided by the Manchester Tank Company, Lynwood, California:

    a. "Performance and Economy LP Gas Motor Fuel," prepared by Manchester Tank Company.

    b. "Care and Handling of LP Gas as a Motor Fuel," published by the Western Liquid Gas Association, San Francisco, California, 1966.

    c. "The Experts in Pressure Vessels," Manchester Tank Company 25th Year.

    d. "Evaluation of LPG as a Motor Fuel," letter from Rodney L. Inman, Industrial Engineer, State of California, Business and Transportation Agency, to Mr. E. L. Tinney, Equipment Engineer, 22 February 1971.

    e. "Propane as an Engine Fuel for Cleaner Air," National LP-Gas Association, Chicago, Illinois.

    f. McDonagh, Allan M., Harry J. Palola, and Lynn M. Treadway, "Alternate Fuel Systems," a report to The Ford Motor Company, published by California State College, Long Beach, School of Engineering, Mechanical Engineering Department.

12. State of California Air Resources Board Resolution 69-8, 15 January 1969.

13. State of California Air Resources Board Resolutions 70-9/A/B/C/D/E/F, 28 January through 21 July 1971.

14. Caltech Clean Air Car Project, "Gaseous Fuels Manual," California Institute of Technology Environmental Quality Laboratory, Pasadena, California, 1 November 1971.

15. "California Exhaust Emission Standards and Test Procedures for Motor Vehicles Modified to Use Liquified Petroleum Gas or Natural Gas Fuel," State of California Air Resources Board, 28 November 1969.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 56 - Crankcase Blowby and Idle Air Bleed Modification

1. Three glossy photos, Schematic No. 333000-1, titled "Fuel Preparation System Modification for 2V Carburetor."
2. Memorandum, titled "Landrum Experimental Spark Plug Evaluation, Department of Health, Education, and Welfare," 15 April 1969.
3. Letter, Ethyl Corporation, Research and Development Department, "Exhaust Emission Test Report," 5 June 1970.
4. Landrum Research memo, 3 June 1970, "Exhaust Emission Test Report."
5. Memo, Scott Research Laboratories, Inc., titled "MV PCB Test Cycle Calculations," 27 March 1967.
6. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*7. Photograph No. BB042.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 57 - Air Bleed with Exhaust Gas Recirculation and Vacuum Advance Disconnect

1. Litvak letter, "Analysis of Effectiveness and Costs of Retrofit Emission Control Systems for Used Vehicles," 29 July 1971.

2. System Description, "The Litvak System."

3. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*4. Photograph Nos. BB059 and BB062.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 59 - Three-Stage Exhaust Gas Control System

1. Atlantic Richfield Diagnostic Report, Carburetor Modification System, 19 August 1971.

2. Newspaper clipping, "Turn of a Screw Cuts Pollution from Her Car," 19 August 1971.

*3. Olson Laboratories Test Report Nos. 570 and 571, "Before and After Installation of Anti-Pollution Device," 12 April 1971.

*4. Olson Laboratories Test Reports, 13 January 1970 and 4 March 1970, "Vehicle Exhaust Emission Test Report for Manfredi Enterprises."

5. Manfredi Enterprises Test No. 1-1150-2, "Exhaust Emission Test Summary," 23 January 1970.

6. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

INVENTORY OF RETROFIT SOURCE DATA

Device No. 62 - Catalytic Converter

*1. Thomson, John C., "Exhaust Emissions from an Army M-151 Equipped with a Mitsui Catalyst," Report 71-22, EPA Motor Source Pollution Control Program, Air Pollution Control Office, March 1971.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 69 - Electronic-Controlled Vacuum Advance Disconnect and Carburetor Lean Idle Modification

1. Baseline Test, "Cold Start and Driveaway Evaluation," 16 October 1968.

2. Device Test, "Cold Start and Driveaway Evaluation," 16 October 1968.

3. Brochure, July 1971, "The Polimiter, Automotive Exhaust Emissions Control."

4. Blueprint No. EX100-475, "Carter Emission Control Kit," 21 September 1971.

*5. Olson Laboratories Test Report, 13 February 1969, "Vehicle Exhaust Emission Test 1967 Ford XL for Optimizer Control Corporation."

*6. Olson Laboratories TWX, 5 October 1971, subject "Retrofit Carburetor Numbers and Model."

7. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*8. Photograph No. BB058.

Device No. 93 - Catalytic Converter with Exhaust Gas Recirculation, Spark Modification, and Lean Idle Mixture

*1. Thomson, John C., "Emission Results from a Texaco Catalyst Concept Applied to a Previously Uncontrolled Engine," Report 71-26, EPA Mobile Source Pollution Control Program, Air Pollution Office, April 1971.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 95 - Ignition Spark Modification

*1. Thomson, John C., "Exhaust Emissions from a Passenger Car Equipped with the Paser Magnum Electronic Anti-Pollution Engine Economizer," HEW/NAPCA Division of Motor Vehicle Research and Development, September 1970.

*2. Thomson, John C., "Exhaust Emissions from a 1971 Passenger Car Equipped with the Paser Magnum Electronic Anti-Pollution Engine Economizer," Report 71-31, EPA Bureau of Source Pollution Control, Office of Air Programs, June 1971.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 96 - Catalytic Converter with Distributor Vacuum Advance Disconnect

*1. Retrofit Study Program Emission and Driveability Test Data.

2. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*3. Photograph Nos. BB066 and BB067.

*4. Thomson, John C., "Exhaust Emissions from a Passenger Car Equipped with a Universal Oil Products Catalytic Converter," EPA Division of Motor Vehicle Research and Development, Air Pollution Control Office, Report 71-16, December 1970.

5. Universal Oil Products Company, Des Plaines, Illinois, "Purzaust Retrofit System," Description and Installation Instructions, 1965 Chevrolet - 327 CID, Kit Type C (no report number), undated report.

6. Universal Oil Products Company, Des Plaines, Illinois, "Purzaust Retrofit System," Description and Installation Instructions, 1961 Chevrolet - 283 CID, Kit Type C (no report number), undated report.

7. Universal Oil Products Company, Des Plaines, Illinois, "Purzaust Retrofit System," Description and Installation Instructions, 1965 Chevrolet, Nova - 194 CID, Kit Type A (no report number), undated report.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 100 - Turbocharger

*1. Thomson, John C., "A Report on the Exhaust Emissions from a Turbocharged Volkswagen," Draft Report, EPA Division of Emission Control Technology, Bureau of Mobile Source Pollution Control, Office of Air Programs, May 1971.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 160 - Closed or Open Blowby Control System with Filter

1. Oildex Brochure.

2. United States Testing Company, Inc., Test Report, "On Gas Analysis on Automobile Exhaust Gas," Laboratory No. 8473, W.O. 3133.

3. Oildex Installation Instruction, 18 June 1965.

4. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*5. Photograph No. BB035.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 164 - Exhaust Gas Filter

1. Ethyl Corporation Test Report, 21 April 1971; 17 August 1971; 31 August 1971; "Emission Test of an Exhaust Filtering System."
2. Summary of Gaseous Emission Tests, 17 August 1971.
3. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).
4. Letter, 3 June 1971, from Ethyl Corporation Research and Development Department (Research Laboratories, 1600 West Eight Mile Road, Ferndale, Michigan 48220) to Device 164 Developer, with Exhaust Emission Test Report attached.
5. Polaroid photograph.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 165 - Exhaust Gas Afterburner/Recirculation with Blowby and Fuel Evaporation Recirculation

1. Air Resources Board Test Report, "Project 196, Emission Test of Penkova Exhaust Control System," June 1970.
2. Air Resources Board Test Report, "Project 196, Emission Test of Modified Penkova Exhaust Control System," December 1970.
3. Air Resources Board Test Report, "Project 196, Tests 2 and 3, Emission Test of Modified Penkova Exhaust Control System," 29 June 1971.
4. Scott Research Laboratories, Inc., Final Report, "Federal Cold Start Exhaust Emissions Test, 1965 Ford, for Mr. Charles C. Penkova," 4 May 1970.

*5. Olson Laboratories Incorporated Testing Agreement, 2 February 1971.

6. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*7. Photograph No. BB045.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 170 - Closed Blowby Control System

1. Letter by Donald D. Binder, President, Automotives Associates International, Inc., 75 Narcissa Drive, Portuguese Bend, California (Tel 377-8507 or 377-8517), subject: Participation in "Analysis of Effectiveness and Costs of Retrofit Emission Control Systems for Used Vehicles," 22 July 1971.

2. McJones, R. W., and J. W. Huron, "Control of Crankcase Emissions Through the Use of Negative Crankcase Pressure," Society of Automotive Engineers, Inc., 485 Lexington Avenue, New York 17, N.Y., West Coast Meeting Los Angeles, California, Report No. 660547, 8-11 August 1966.

3. Letter from Donel R. Olson, Director, San Bernardino Laboratory, Scott Research Laboratories, Inc., to K&B Manufacturing Corporation, 12152 South Woodruff Avenue, Downey, California, 12 August 1964, subject: Effect of Device 170 on Reduction of Exhaust Nitrogen Oxides.

4. Letter from Donel R. Olson, Director, San Bernardino Laboratory, Scott Research Laboratories, Inc., to K&B Manufacturing Corporation, 12152 South Woodruff Avenue, Downey, California, 10 November 1964, subject: Mode by Mode Calculations for the Exhaust Emission Tests conducted on 28 October 1964.

5. Webb, Milton J., Scott Research Laboratories, Inc., 2600 Cajon Boulevard, San Bernardino, California, for K&B Manufacturing Corporation, 12152 South Woodruff Avenue, Downey, California, "Blowby Measurement and Exhaust Emission Testing 1956 Chevrolet," 28 October 1964.

6. Functional Schematic, K&B Closed Crankcase Control, Normal Engine Operation, published by K&B Manufacturing Corporation.

7. Functional Schematic, K&B Closed Crankcase Control, Fast Acceleration or Hill Climbing, published by K&B Manufacturing Corporation.

8. VAC-U-TRON (a controlled vacuum system for smog reduction), K&B Manufacturing Corporation, 12152 Woodruff Avenue, Downey, California, A Subsidiary of Aurora Plastics Corp.

9. Patent No. 3,139,080, McMahon, R. E., "Internal Combustion Engine," 30 June 1964, filed 16 July 1962.

10. Patent No. 3,362,386, McMahon, R. E., "Internal Combustion Engine," 9 January 1968, filed 17 May 1965.

11. Suggested Dealer Price Schedule, Form PS-1-D, 15 April 1968, published by K&B Manufacturing Corporation.

12. Wholesaler Price Schedule, Form PS-1-W, 15 April 1968, published by K&B Manufacturing Corporation.

13. Suggested Retail Price Schedule, Form PS-1-R, 15 April 1968, published by K&B Manufacturing Corporation.

14. VAC-U-TRON Installers Kit (Stock No. 5233) - Contents and Suggested List Price, published by K&V Manufacturing Corporation.

15. Letter by John A. Maga, Executive Officer, State of California Air Resources Board, 14 December 1970, subject: Adoption of Resolution 70-88.

16. Installers Manual on High Efficiency - Vacuum Operated Crankcase Emission Control System, Weatherly Index 660, published by K&B Manufacturing Corporation.

17. Service Manual on Crankcase Emission Control System, Weatherly Index 660, published by K&B Manufacturing Corporation.

18. VAC-U-TRON Engine Guard, approved crankcase emission control system, published by K&B Manufacturing Corporation.

19. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

INVENTORY OF RETROFIT SOURCE DATA

Device No. 172 - Intake Manifold Modification

*1. Thomson, John C., "Exhaust Emissions from a Vehicle Equipped with the Roberts Induction Device Modification Supplied under Contract CPA 70-51," Report 71-14, EPA Division of Motor Research and Development, December 1970.

2. "A General Report on the Design, Performance and Cost of the Emissions Control System," PAS Corporation, 9001 Rosehill Road, Lenexa, Kansas 66215, 6 August 1971. (Revised as per letter dated 17 August 1971 from Paul E. Berger, PAS Corporation.)

3. Functional schematic view of one intake "RAM" using gasket configuration, Charles G. Roberts and Son, Designers, 1015 N. Michigan, Howell, Michigan 48843, Tel (517) 546-2672.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 175 - Ignition Timing Modification with Lean Idle Adjustment

1. California Air Resources Board Resolution 71-72, September 1971, Amendment 71-72A, December 1971.

2. Letter from Emission Control Technology, Inc., 1240 West Collins Ave., Orange, California 92667, 4 August 1971, subject: Participation in retrofit emission control system program sponsored by the Environmental Protection Agency (EPA), Contract No. 68-04-0038, with enclosure on "System Description/Installation Procedure."

3. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*4. Photograph No. BB195.

. INVENTORY OF RETROFIT SOURCE DATA

Device No. 182 - Fuel and Oil Additives

1. Letter from Combustion Chemicals Corporation, 15720 Ventura Boulevard, Encino, California 91316, by Morton W. Marcus, 5 August 1971, subject: Participation in program of "Analysis of Effectiveness and Costs of Retrofit Emission Control Systems for Used Vehicles" (No. 68-04-0038) with enclosure of emission tests from City of Los Angeles.

2. Letters to Combustion Chemicals Corporation from R. D. Allen, Manager, Transportation, Douglas Aircraft Division, 3855 Lakewood Boulevard, Long Beach, California 90680, 6 February 1970 (No. C1-39-RDA-062), subject: Test Data on FE-plus additive in Douglas' gasoline and diesel driven vehicles.

*3. Test report on two 1968 Fords and two 1969 Fords with FE-plus gasoline additive. Tests run on 10 July 1970 through 13 August 1970 for Combustion Chemicals Corporation by Olson Laboratories.

4. American Honda Corporation Test Report for FE-plus (E300A), by The Bob Bondurant School of High Performance Driving, 1983 South Ritchey, Santa Ana, California 92705.

5. "Baja 500 Questionnaire Results" on evaluation of FE-plus gasoline and oil additives during off road race in Baja California, Mexico, 22 September 1970, by Combustion Chemicals Corporation (SCO/MAR).

6. Glyco cam bearings from Volkswagen racing engines using same brand of racing oil, same number of competition hours (Baja 500 and Ascot). Engines prepared by, and tests conducted by John Miguel, 5793 Las Indios Circle, Buena Park, California (714) 826-6005.

7. Test report no. 7129 to Combustion Chemicals Corporation (SCO/MAR) Purchase Order No. 5505, by Admerco, Inc., Materials Research and Environmental Testing Laboratory, 14721 Lull Street, Van Nuys, California, subject: To determine corrosion properties of FE-plus additive in various fuels and lubricants in connection with a variety of materials, 26 February 1970.

8. Riney, Tom, "Another Point for Ecology," Evening Outlook, 26 January 1971.

9. Test report on FE-plus engine lubricant from petrolane, Carburetion Service Center, 5037 East Telegraph Road, Los Angeles, California, to Combustion Chemicals Corporation (SCO/MAR), 23 June 1971.

*10. Telecon 2 March 1972 between B. L. Ryle, Combustion Chemicals Corporation, P.O. Box 444, Calahasas, California 91302, Tel (213) 884-0383, and D. J. Dewey, Olson Laboratories, subject: Additive Cost and Quantity per Gallon Information.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 244 - Rich Thermal Reactor

1. Scott Laboratories, Inc., Final Report No. 2883, "Federal Cold Start Exhaust Emission Test on a 1970 Chevrolet," 18 March 1970.

2. Brochure, "Exhaust Manifold Reactor."

*3. Thomson, John C., "Exhaust Emissions from a Passenger Car Equipped with a DuPont Exhaust Emission Control System," HEW/NAPCA Division of Motor Vehicle Pollution Control, May 1970.(1)

*4. Thomson, John C., "Exhaust Emissions from a Passenger Car Equipped with a DuPont Exhaust Emission Control System Using 1975 Test Procedure," Report 71-3, HEW/NAPCA Division of Motor Vehicle Research and Development, August 1970.(1)

5. Cantwell, E. N., I. T. Rosenlund, W. J. Barth, F. L. Kinnear, and S. W. Ross, "A Progress Report on the Development of Exhaust Manifold Reactors," SAE Paper 690139, January 1969.

6. Cantwell, E. N., "A Total Exhaust Emission System," Document A-72692, Petroleum Laboratory, E. I. duPont de Nemours & Co., Inc., Wilmington, Delaware.

7. "Today: The Elimination of Automobile Air Pollution," Document A-70135, du Pont Petroleum Chemicals.

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(1) The Device 244 reactor was used in combination with EGR and particulate control in these tests (refer to Device 469).

INVENTORY OF RETROFIT SOURCE DATA

Device No. 245 - Variable Camshaft Timing

*1. Thomson, John C., "Exhaust Emissions on an Uncontrolled Passenger Car Using Variable Cam Timing," HEW/NAPCA Report 71-4, August 1970.(1)

*2. Thomson, John C., "An Evaluation of a Variable Cam Timing Technique as a Control Method for Oxides of Nitrogen," HEW/NAPCA Report 71-11, October 1970.(1)

3. Brochures, "Installation Instructions," "Distributor Price List," "Varicam Application Sheet," "Varicam Brochure."

4. Magazine Reprints, "Quicker & Quicker & Quicker," August 1968.

5. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*6. Freeman, Max A., and Roy C. Nicholson, "Valve-Timing for Control of Oxides of Nitrogen (NOx)," SAE Paper 720121, January 1972.

*7. "Variable Cam Timing as an Emission Control Tool," SAE 700673.

*8. Photograph Nos. BB030 and BB031.

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(1) The variable cam timing device tested by EPA is not the same as Device 245, but was used for comparison purposes in the study of Device 245.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 246 - Speed-Controlled Exhaust Gas Recirculation with Vacuum Advance Disconnect

1. Environmental Protection Agency Test, "Emission Test of a Perfect Circle Speed Controlled Exhaust Recirculation (RETRONOX) System, 27 July 1971 to 30 July 1971.

2. Test Report Nos. 829-F-001, 946-F-002, 946-F-003, and 946-F-005, "Reduction by External Means of Pollutants in Exhaust Emissions from Automotive Engines," 21 September 1970, 10 August 1971, 30 August 1971, and 23 September 1971.

3. Brochure, "Dana-Perfect Circle, Speed-Controlled Exhaust Recirculation System," 16 June 1971.

4. System Description, "Dana RETRONOX System."

5. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*6. Gompf, Henry L., "Evaluation of the Emission Reduction with the Perfect Circle Retronox Speed Controlled EGR System," EPA Office Mobile Source Pollution Control Program, Office of Air Programs, Report 72-8, October 1971.

*7. Photograph Nos. BB049 and BB057.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 259 - Photocell-Controlled Ignition System

1. Corona Engineering Summary Test Report, "Emission Test of a Corona Ignition System."
2. Corona Engineering Supplementary Information, "Corona Ignition System."
3. Letter, 2 November 1971, "Reduced Air Pollution," from Corona Engineering.
4. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*5. Photograph Nos. BB123, BB124, BB125, BB126, BB129 and BB130.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 268 - Capacitive Discharge Ignition

1. Brochure, "Delta Mark Ten Installation Instructions," 1 June 1967.

2. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*3. Photograph No. BB194.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 279 - Fuel Conditioner

1. Brochure, "Saranga Industries Fuel Activators, More Power, No Smog."
2. Patent Specification No. 814,269, 3 June 1959.
3. Letter "Fuel Activator," from Watkins's Trucks, Inc., 16 June 1971.
4. Disclosure Document No. 006381, "Method & Device for Increasing the Combustion Efficiency of Liquid Fuels," 16 August 1971.
5. Stevens Institute of Technology Test Report No. 3797/637, "Exhaust Emission Test on a 1969 Chevrolet," 31 March 1971.
6. Stevens Institute of Technology Test Report, "Test on a GMC Diesel Truck Equipped with a Saranga Fuel Activator."
7. Lehigh Testing Laboratories Test Report No. 214,832, "Emission Testing of Saranga Fuel Activator."
8. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*9. Photograph No. BB040.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 282 - LP Gas Injection

1. J&S Carburetor Company Test Report, "Carburetor Test," 16 January 1971.
2. Brochure No. 1031, "Get the Lead Out of Your Gas."
3. Brochure No. PS-1032, "Propane Anti-Knock Injector Kit and Tanks," November 1970.
4. Brochure No. 1040, "The J&S Phoenix #40."
5. Brochure No. 1246, "How to Install the Model 700 or 750 Regulator and Jet-Flow Adapter."
6. Brochure No. 1250, "The New Jet-Flow LP Kit."
7. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*8. Photograph Nos. BB104 and BB105.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 288 - Carburetor Main Discharge Nozzle Modification

1. Bodai, Conrad A., PhD, "Summary of Reported Measurements by Independent Laboratories."

2. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*3. Photograph Nos. BB032 and BB033.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 292 - Catalytic Converter

*1. Thomson, John C., "A Report on the Exhaust Emissions of an Army M-151 1/4-Ton Truck Using an Exhaust Catalyst," Report 71-13, EPA Division of Motor Vehicle Research and Development, December 1970.

2. Engelhard Industries Sales Brochures, Forms EM-8958, EM-6366, and "Engelhard Accepts the Challenge with the PTX Catalytic Exhaust Purifier," Engelhard Industries, A Division of Engelhard Minerals and Chemicals Corporation, New Jersey.

3. Bilhuber, Val, "The Key That Unlocked the Docks," reprinted from NLPGA Times, August 1968, for Engelhard Minerals & Chemicals Corporation.

*4. Telecons between M. L. Webb, Olson Laboratories, Project Engineer, Contract 68-04-0038, and Herbert Morreall, Engelhard Industries, on 14 and 15 October 1971.

Device No. 294 - Exhaust Gas Recirculation with Carburetor Modification

*1. Thomson, John C., "Exhaust Emission from Passenger Vehicles Equipped with Doughboy Carburetors," Report 71-15, EPA Division of Motor Vehicles Research and Development, Air Pollution Control Office, December 1970.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 295 - Carburetor with Variable Venturi

1. Letter, Pollution Controls Industries, Inc., "System Description, Variable Venturi Carburetor (VCC)," 27 August 1971.

2. Scott Research Laboratories, Inc., Test Report, "Emission Tests, 1966 Ford Mustang," 4 February 1971.

3. System Description, "Description of the PCI Variable Venturi Carburetors."

4. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*5. Photograph Nos. BB047 and BB048.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 296 - Ignition Timing and Spark Modification

1. Cont-Ignitron Co. Brochure, "The Equalizer."

2. California Air Resources Board, "Evaluation Tests of Exhaust Emission Control Device," Project 205, July 1971.

3. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*4. Photograph Nos. BB052, BB060, and BB061.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 308 - Exhaust Gas Afterburner

1. Arizona State Department of Health Test Report, "Vehicle Emission Test," 28 July 1971.

2. Vehicle Emission Test, 1967 Chevrolet, With and Without Device 308 Installed, Arizona State Department of Health, Division of Air Pollution Control Test Report, 11 November 1971.

3. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*4. Photographs BB054 and BB055.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 315 - Closed Blowby Control System

*1. Olson Laboratories, Inc., Test Report, "Final Report for the Nycal Company, Inc.," 7 October 1969.

2. Stevens Institute of Technology Test Report, 23 June 1971.

3. Copy of Patent: No. 3,495,578, 17 February 1970.

4. Miscellaneous Test Reports.

5. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*6. Photograph Nos. BB064 and BB065.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 317 - Carburetor Modification with Vacuum Advance Disconnect

1. HEW, Motor Vehicle Compliance Section Test Report, 8 March 1967.
2. Scott Research Laboratories, Inc., Test Report, "Final Report, Federal Cold Start Exhaust Emission Test, 1963 Cadillac for Mr. R. Loudenslager," 16 February 1970.
3. Scott Research Laboratories, Inc., Test Report, "Final Report Federal Cold Start Exhaust Emission Tests, 1967 Cadillac, for Mr. R. Loudenslager," 22 May 1970.
4. Air Resources Board Test Report, "Project 189 Emission Test of A.E.C. Exhaust Emission Control Device," 4 November 1970.
5. Speed Specialists, Inc., Test Report, "Automotive Emission Control Device (A.E.C.)," 23 March 1971.
6. System Description, "The Theory of the A.E.C. Retrofit Emission Control Device," George P. Fetting, Coordinating Designer, 27 September 1971
7. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*8. Photograph No. BB063.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 322 - Exhaust Gas Backpressure Valve

*1. Verelli, Leonard D., "Exhaust Emissions from a Passenger Car Equipped with the 'Wilford Smog Suppressor'," HEW/NAPCA Report 71-9, October 1970.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 325 - Air-Vapor Bleed to Intake Manifold

1. Automotive Testing Laboratories, Inc., Test Report "On Servi-Tech Vapor Injection for Servi-Tech, Inc."
2. Scott Research Laboratories, Inc., Test Report SRL 2956 01 0371, "Final Report, California 7-Mode Hot Cycle Emission Test for Servi-Tech, Inc., 2 March 1971.
3. California Air Resources Board Test Report, "Tests No. 201-1 and 201-2, California 7-Mode Hot Cycle Emission Test for Servi-Tech, Inc.," 16 March 1971.
4. Servi-Tech, Inc., Brochure, "Why Auto Emission Control."
5. Servi-Tech, Inc., Brochure, "Auto Emission Control System."
6. Automotive Testing Laboratories, Inc., Test Report.
7. Servi-Tech, Inc., Brochure, "Auto Emission Control System Installation Instructions."
8. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

INVENTORY OF RETROFIT SOURCE DATA

Device No. 384 - Air-Fuel Mixture Diffuser

1. Memo, Hydro-Catalyst Corporation, "Installation Instructions for Carburetor Catalyst," 20 October 1971.

2. Schematic No. 419, "Hydro-Catalyst Device for Buick Rev. Pt. No. 1237019," Triple P, Inc., Division of F. D. Farnam Company.

3. Test No. 89, Stevens Institute of Technology, Exhaust Emission Test, 20 May 1971.

4. Patent Disclosure, Figure 1, Improved Design.

5. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*6. Photograph Nos. BB036 and BB038.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 401 - Air-Vapor Bleed to Intake Manifold

1. Brochure on "Turbo Vapor Injector," distributed by St. Clair Sales & Distribution, Inc., 2792 Goodells Rd., Goodells, Michigan 48027.
2. Test Report, "Turbo Vapor Injector," No. 002104A by Detroit Testing Laboratory, 12800 Northend Avenue, Detroit, Michigan for St. Clair Sales & Distribution, Inc., 24 March 1970.
3. Final Report, "Cold Start and Hot Start Exhaust Emission Tests," Project No. 51023, for St. Clair Sales & Distribution, Inc., 20 May 1970.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 408 - Exhaust Gas and Blowby Recirculation with Intake Vacuum Control and Turbulent Mixing

1. System Description, "Principle of Operation."
2. Copy of Patent No. 3,273,550, 20 September 1966.
3. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*4. Photograph No. BB134.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 418 - Air Bleed to Intake Manifold

*1. Gompf, Henry L., "Exhaust Emissions from Two-Passenger Vehicles Equipped with "Fumcell," Report 71-25, EPA Mobile Source Pollution Control Program Air Pollution Control Office, 26 November 1971.

*2. 7-Cycle, 7-Mode Emission Test Results With and Without Device 418, Project 51018, 27 March and 1/7 April 1970, Olson Laboratories, Inc.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 425 - Exhaust Gas Afterburner

1. U.S. Patent No. 3601982.
2. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).
3. Letter from James W. McCrocklin, President, Clean Environment, Inc., McLean Gardens Apartments, Benning Hall, Room 143-2, 3445 38th St., N.W., Washington, D.C. 20016, in reply to OLI's letter of 14 September 1971, 23 September 1971, subject: Participation in "Analysis of Effectiveness and Costs of Retrofit Emission Control Systems for Used Vehicles" program.
4. Letter from James W. McCrocklin, President, Clean Environment, in response to OLI's letter of 14 October 1971, 20 October 1971, subject: Emission Test Results.
5. McCrocklin, James W., "Development of Low-Emission Vehicles" (Technical Characteristics of Device 425), Clean Environment, Inc., Washington, D.C., 19 June 1971.
6. McCrocklin, James W., "A Comparative Analysis of Exhaust Emission Control Systems" (Effectiveness of the Inter-Industry Emission Control Concept Versus Device 425 System), Clean Environment, Inc., Washington, D.C., 17 April 1971.
7. Letter from Harold J. Gibson, Manager, Detroit Laboratories, Ethyl Corp., 1600 West Eight Mile Road, Ferndale, Michigan 48229, to APPCA, Inc., 7147 Woodland Drive, Springfield, Virginia 22151, attn: Capt. James McCrocklin, with Exhaust Emission Test Report attached, 20 August 1970.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 427 - Closed or Open Blowby Control System with Filter

1. Parts Catalog 1971/1972, "Engine Vent System."

2. Installation & Service Instructions, "Lift Truck Applications."

3. Engine Vent General Installation Instructions.

4. Scott Laboratories Test Report No. 2422, "Crankcase Blowby Measurement for Fleet Vehicle Selection," 28 February 1967.

5. Scott Laboratories Test Report No. 2601, "California Bench Flow Characteristics of Engine Vent Systems," 5 February 1969.

*6. Summary of Vehicle Exhaust Emission Test Report Performed by Olson Laboratories, Inc., 24 March 1970.

7. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

*8. Photograph No. BB050.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 430 - Induction Modification

1. System Description, "The Vaporizer."
2. Installation Instructions.
3. Stevens Institute of Technology Test Report, 7 August 1966.
4. Scott Research Laboratories, Inc., Test Reports, Project 1249, -01, -02.
5. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).

INVENTORY OF RETROFIT SOURCE DATA

Device No. 433 - Air-Vapor Bleed to Intake Manifold

1. Auto Pollution Control Corporation Brochure, "Vapor Injection System Installation Instructions."

2. Auto Pollution Control Corporation Brochure, "Vapor Injection System."

3. Auto Pollution Control Corporation Brochure, "Vapor Injection Needle - Product Information, Application Chart, Test Results."

4. Automotive Testing Laboratories, Inc., Test Report, "Supplement to Test Report on Servi-Tech Vapor Injection for Servi-Tech, Inc."

5. Scott Research Laboratories, Inc., Test Report, SRL 2956 01 0371, "Final Report, California 7-Mode Hot Cycle Emission Test," 2 March 1971.

6. Auto Pollution Control Corporation Test Report, "Tests Performed by Gonzaga University, Spokane, Washington."

*7. Photograph Nos. BB039 and BB051.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 440 - Air-Fuel Mixture Deflection Plate

1. System Description.
2. Copy of Patent No. 3,393,984, 23 July 1968.
3. "Test Experience Summary," 12 June 1967.
4. Retrofit Data Survey Questionnaire Response (refer to Appendix V-3).
5. Device configuration photograph.

Device No. 457 - Water Injection

*1. Hollabaugh, D. M., "The Effects of Water Injection on Nitrogen Oxides in Automotive Exhaust Gas," Project B-1-7-2, 1966, Air Pollution Control Association.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 458 - Air Bleed to Intake Manifold

*1. Thomson, John C., "Emissions Results from an Automobile Using the Frantz Vapor Injector," EPA Report 72-5, EPA Office of Air Programs, September 1971.

Device No. 459 - LPG Conversion with Deceleration Unit

*1. Hopkins, Howe H., "Feasibility of Utilizing Gaseous Fuels for Reducing Emissions from Motor Vehicles," Unpublished Report, EPA Division of Motor Vehicle Research and Development, 24 November 1971.

*2. Telecon between T. R. Godburn, Applications Engineer, Marvel-Schebler Division of Borg-Warner, Decatur, Illinois, and W. R. Hougland, EPA Project 68-04-0038, Documentation Task Leader, 14 February 1972.

*3. Gompf, Henry L., "Exhaust Emissions from a Passenger Car Powered by Marvel-Schebler LPG Conversion," HEW/NAPCA Report 71-8, September 1970.

4. Form No. 9653, Century Gas Equipment, "LPA Motor Fuel and You," Marvel-Schebler Division, Borg-Warner, Decatur, Illinois.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 460 - Compressed Natural Gas Dual-Fuel Conversion

*1. "Emission Reduction Using Gaseous Fuels for Vehicular Propulsion," Final Report on Contract No. 70-69 for Environmental Protection Agency, Air Pollution Control Office, by the Institute of Gas Technology, Chicago, Illinois, June 1971.

2. State of California Air Resources Board Resolutions 70-9/A/B/C/D/E/F, 28 January through 21 July 1971.

*3. Thomson, John C., "An Evaluation of the Exhaust Emissions from Two Vehicles Equipped with Compressed Natural Gas Conversion Kits," Report 71-17, EPA Division of Motor Vehicle Research and Development, Air Pollution Control Office, December 1970.

4. "Interest in Compressed Natural Gas Carburetion Grows as Pacific Lighting's Dual-Fuel System Gains Approval," A Gas Industries Publication by Paul Lady, Associate Publisher.

5. "Exhaust Emission Tests of Pacific Lighting Model 1.25 Natural Gas Dual-Fuel (Modified IMPCO 300A)," Pacific Lighting Service Company, Los Angeles, California, September 1969.

6. "Reduction of Air Pollution by the Use of Natural Gas or Liquified Petroleum Gas Fuels for Motor Vehicles," State of California Air Resources Board, 18 March 1970.

*7. Hopkins, Howe H., "Feasibility of Utilizing Gaseous Fuels for Reducing Emissions from Motor Vehicles," Unpublished Report, EPA Division of Motor Vehicle Research and Development, 24 November 1971.

8. McDonagh, Allan M., Harry J. Palola, and Lynn M. Treadway, "Alternate Fuel Systems," a report to the Ford Motor Company, California State College, School of Engineering, Mechanical Engineering Department, 4 June 1971.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 461 - LPG Conversion with Exhaust Reactor Pulse Air Injection and Exhaust Gas Recirculation

*1. Thomson, John C., "Exhaust Emissions from a Reactor Equipped, Full-Size Automobile Using LPG Fuel," Report 71-21, EPA Division of Emission Control Technology, Mobile Source Pollution Control Program, Air Pollution Control Office, March 1971.

Device No. 462 - Air Bleed to Intake and Exhaust Manifolds

*1. Thomson, John C., "Exhaust Emissions from Controlled and Uncontrolled Vehicles Using the "Pollution Master" Emission Control Device," Report 72-1, EPA Office of Air Programs, August 1971.

Device No. 463 - Rich Thermal Reactor with Exhaust Gas Recirculation and Spark Retard

*1. Lang, Robert J., "A Well-Mixed Thermal Reactor System for Automotive Emission Control," SAE Paper 710608, June 1971.

*2. Thomson, Jonn C., "An Evaluation of the Emissions Characteristics of the Esso Well-Mixed Thermal Reactor," Report 72-3, EPA Office of Air Programs, August 1971.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 464 - Methanol Fuel Conversion with Catalytic Converter

*1. Ashby, Anthony H., "Emissions from the Methanol Fueled Stanford University Gremlin, Report 72-4, EPA Office of Air Programs, August 1971.

*2. Telecon between Ernest Lovelin, Chemist, Amsco Division of Union Oil Co., La Mirada, California, and W. R. Hougland, EPA Project 68-04-0038, Documentation Task Leader, 3 February 1972.

Device No. 465 - Fuel Additive

*1. Verrelli, Leonard D., "Exhaust Emissions from a Passenger Car with Gasoline Treated with Bycosin Fuel Additive," Report 71-24, EPA Division of Emission Control Technology, Mobile Source Pollution Control Program, Air Pollution Control Office, April 1971.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 466 - LPG-Gasoline Dual-Fuel Conversion

*1. Caggiano, Michael A., "Emissions from Two LPG Powered Vehicles," HEW/NAPCA Division of Motor Vehicle Pollution Control, February 1970, (Unnumbered Report).

*2. Ashby, H. Anthony, "Exhaust Emissions from Seven LP Gas Powered Vehicles," Report 71-1, HEW/NAPCA Division of Motor Vehicle Research and Development, July 1970.

*3. Telecon between Ralph Abbot, Chief Engineer, Algas Industries, Dallas, Texas, and W. R. Hougland, EPA Project 68-04-0038, Documentation Task Leader, 14 February 1972.

4. California Air Resources Board Resolution 71-29/A/B, Acceptance of Device 466 Carburetor Model PCAMX500A for 300-CID and Over Engines of Light-Duty Vehicles, 21 July 1971.

INVENTORY OF RETROFIT SOURCE DATA

Device No. 467 - Fuel Evaporation Control System

*1. Deeter, W. F., H. D. Daigh, and O. W. Wallin, Jr., "An Approach for Controlling Vehicle Emissions," Society of Automotive Engineers (SAE) Report No. 680400, Two Pennsylvania Plaza, New York, N.Y. 10001, Mid-Year Meeting, 20 - 24 May 1968.

*2. Telecon between Parts Manager, McCoy-Mills, Ford Dealer, Fullerton, California, and Charles Mertz, Northrop Systems Engineer on 10 January 1971, subject: To obtain parts breakdown and costs for installation of evaporative system.

Device No. 468 - Lean Thermal Reactor with Exhaust Gas Recirculation

*1. The Aerospace Corporation, "An Assessment of the Effects of Lead Additives in Gasoline on Emissions Control Systems Which Might be Used to Meet the 1975-1976 Motor Vehicle Emission Standards," Aerospace Report No. TOR-0172 (2787)-2, 15 November 1971."

Device No. 469 - Rich Thermal Reactor with Exhaust Gas Recirculation and Particulate Control

1. Cantwell, E. N., "A Total Exhaust Emission System," Document A-72692, Petroleum Laboratory, E. I. du Pont de Nemours & Co., Inc., Wilmington, Delaware.

*2. Thomson, John C., "Exhaust Emissions from a Passenger Car Equipped with a DuPont Exhaust Emission Control System, HEW/NAPCA Division of Motor Vehicle Pollution Control, May 1970, (Unnumbered Report).

*3. Thomson, John C., "Exhaust Emissions from a Passenger Car Equipped with a DuPont Exhaust Emission Control System Using 1975 Test Procedure," Report 71-3, HEW/NAPCA Division of Motor Vehicle Research and Development, August 1970.

TEST REPORTS PROVIDED BY ENVIRONMENTAL PROTECTION AGENCY (EPA)

Author/Title/Date	Device No.	Volume II Reference
1. Ashby, Anthony H.,		
a. "Exhaust Emissions from Seven LP Gas Powered Vehicles," HEW/NAPCA Report 71-1, July 1970.	466	57
b. "Emissions from the Methanol Fueled Stanford University Gremlin," EPA Report 72-4, August 1971.	464	62
2. Caggiano, Michael A.,		
a. "Emissions from Two LPG Powered Vehicles," HEW/NAPCA Unnumbered Report, February 1970.	52, 466	38
b. "The Effect on Exhaust Emissions of the CETEC Atom-X Device," HEW/NAPCA Unnumbered Report, June 1970.	36	107
3. Gompf, Henry L.,		
a. "Retrofit Emission Control Devices for Pre-1968 Vehicles," HEW/NAPCA Report 71-2, July 1970.	(1)	
b. "Exhaust Emissions from a Passenger Car Powered by Marvel-Schebler LPG Conversion," HEW/NAPCA Report 71-8, September 1970.	459	60
c. "Exhaust Emissions from a Passenger Car Equipped with 'Biap Electronic Ignition Unit'," HEW/NAPCA Report 71-7, September 1970.	23	81
d. "Exhaust Emissions from 10 GSA Rebels and 10 GSA Falcons Equipped with LPG Conversion Kits," HEW/NAPCA Report 71-10, October 1970.	52	39
e. "Exhaust Emissions from a Passenger Car Equipped with 'Brisko's Heavy Duty PCV Valve'," EPA Report 71-20, February 1971.	24	95
f. "Exhaust Emissions from Two Passenger Vehicles Equipped with the ADAKS Device," EPA Report 72-6, September 1971.	1	76
g. "Evaluation of the Emission Reductions with the Perfect Circle Retronox Speed Controlled EGR System," EPA Report 72-8, October 1971.	246	94

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(1) The General Motors, Ford, and Chrysler retrofit devices covered by this report were excluded from study under EPA Contract 68-04-0038 (refer to Contract Exhibit A-III-B)

TEST REPORTS PROVIDED BY ENVIRONMENTAL PROTECTION AGENCY (EPA) (Continued)

	Author/Title/Date	Device No.	Volume II Reference
h.	Draft of "Exhaust Emissions from Two Passenger Vehicles Equipped with Fumcell," EPA Report 71-25, 26 November 1971.	418	88
4.	Hollobaugh, S. M., "The Effects of Water Injection on Nitrogen Oxides in Automotive Exhaust Gas," 1966, APCA Project B-1-7-2.	457	106
5.	Hopkins, Howe H., "Feasibility of Utilizing Gaseous Fuels for Reducing Emissions from Motor Vehicles," Unpublished EPA Report, 24 November 1971.	Various	47
6.	Institute of Gas Technology, Final Report on EPA Contract No. 70-69, "Emission Reduction Using Gaseous Fuels for Vehicular Propulsion," June 1971.	Various	30
7.	Thomson, John C.,		
a.	"Exhaust Emissions from a Passenger Car Equipped with a DuPont Exhaust Emission Control System," HEW/NAPCA Unnumbered Report, May 1970.	244, 469	74
b.	"Exhaust Emissions from a Passenger Car Equipped with a DuPont Exhaust Emission Control System Using 1975 Test Procedure," HEW/NAPCA Report 71-3, August 1970.	244, 469	75
c.	"Exhaust Emissions on an Uncontrolled Passenger Car Using Variable Cam Timing," HEW/NAPCA Report 71-4, August 1970.	245	91
d.	"Exhaust Emissions from a Passenger Car Equipped with the 'Paser Magnum Electronic Anti-Pollution Engine Economizer'," Unnumbered HEW/NAPC Report, September 1970.	95	82
e.	"Exhaust Emissions from a 1971 Passenger Car Equipped with the Paser Magnum Electronic Anti-Pollution Control," EPA Bureau of Source Pollution Control, EPA Report 71-31, June 1971.	95	83
f.	"An Evaluation of a Variable Cam Timing Technique as a Control Method for Oxides of Nitrogen," HEW/NAPCA Report 71-11, October 1970.	245	92
g.	"Exhaust Emissions from a Vehicle Equipped with the Roberts Induction Modification Supplied Under Contract CPA 70-51," EPA Report 71-14, December 1970.	77, 172	97

TEST REPORTS PROVIDED BY ENVIRONMENTAL PROTECTION AGENCY (EPA) (Continued)

Author/Title/Date	Device No.	Volume II Reference
h. "Exhaust Emissions from a Passenger Automobile Equipped with Electronic Fuel Injection," EPA Report 71-12, December 1970.	22	100
i. "Exhaust Emission from Passenger Automobiles Equipped with Doughboy Carburetors," EPA Report 71-15, December 1970.	294	96
j. "A Report on the Exhaust Emissions of an Army M-151 1/4-Ton Truck Using an Exhaust Catalyst," EPA Report 71-13, December 1970.	292	10
k. "Exhaust Emissions from a Passenger Car Equipped with a Universal Oil Products Catalytic Converter, EPA Report 71-16, December 1970.	96	5
l. "An Evaluation of the Exhaust Emissions from Two Vehicles Equipped with Compressed Natural Gas Conversion Kits," EPA Report 71-17, December 1970.	460	67
m. "Exhaust Emissions from a Reactor Equipped, Full-Size Automobile Using LPG Fuel, EPA Report 71-21, March 1971.	461	61
n. "Exhaust Emissions from an Army M-151 Equipped with a Mitsui Catalyst," EPA Report 71-22, March 1971.	62	8
o. "Emission Results from a Texaco Catalyst Concept Applied to a Previously Uncontrolled Engine," EPA Report 71-26, April 1971.	93	9
p. "A Report on the Exhaust Emissions from a Turbocharged Volkswagen," EPA Unnumbered Report, May 1971.	100	99
q. "Exhaust Emissions from Controlled and Uncontrolled Vehicles Using the 'Pollution Master' Emission Control Device," EPA Report 72-1, August 1971.	462	90
r. "An Evaluation of the Emission Characteristics of the Esso Well Mixed Thermal Reactor," EPA Report 72-3, August 1971.	463	102
s. "Emissions Results from an Automobile Using the Frantz Vapor Injector," EPA Report 72-5, September 1971.	458	89

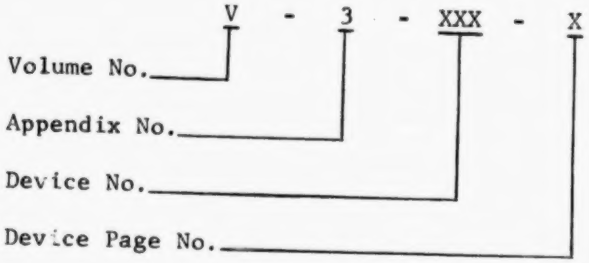
TEST REPORTS PROVIDED BY ENVIRONMENTAL PROTECTION AGENCY (EPA) (Continued)

Author/Title/Date	Device No.	Volume II Reference
8. Verrelli, Leonard,		
a. "Exhaust Emissions from a Passenger Car Equipped with the 'Wilford Smog Suppressor'," HEW/NAPCA Report 71-9, October 1970.	322	22
b. "Exhaust Emissions from a Passenger Car with Gasoline Treated with Bycosin Fuel Additive," EPA Report 71-24, April 1971.	465	105

APPENDIX V-3

DATA SURVEY: QUESTIONNAIRE RESPONSES

This appendix contains the questionnaire responses received from retrofit device development and production sources. The pages of this appendix are numbered as follows:



Questionnaire responses were received for the following devices:

Device

1
33
42
56
57
59
69
75 (1)
96
160
164
165
170
175
245
246
259
268
279
282
288
295
296
308
315
317
325
384
408
425
427
430
440

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(1) Evaluation of this device for vehicle emission effectiveness was not possible from the data supplied by the developer.

RETROFIT INFORMATION OUTLINE

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

- Principles of Operation See attached sales brochure
- Installation Reqm'ts None special--See attached Installation Procedure
- Adjustments See attached Installation Procedure
- MFG Techniques Die casting, stamping, molding, turning. Also see hardware of which two units have been delivered to Olson Laboratories in Anaheim, California.

1.2 Development Status

	Number to Date	
Conceptual/Design Stage	Not known--extended over 8 to 12 years.	
Prototype	Don't know	
Manufactured	8000 Total---500 U.S.A.	
Distributed to Dealer	Adaks has not used dealers up to this time.	
Installed on Vehicles	3000 Total---150 in U.S.A.	
Total Accumulated Miles (Estimated, Thousands)	10,000,000	estimated

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combus-tion	Exhaust				
Hydrocarbon	X							
Carbon Monoxide	X							
Oxides of Nitrogen								
Particulates	X							
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

ADDUIT TO ALL CID.

1002

	AMC	Chrysler	CM	Ford	Foreign (Specify)
Year (Range)	Yes	Yes	Yes	Yes	Yes
Engine CID (Range) up to	800 cu.in.	800 cu.in.	800 cu.in.	800 cu.in.	800 cu.in.
Number of Retrofit Model Types to Satisfy Application	Not known	Not known	Not known	Not known	over 2000

2. Performance Data

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	Federal 7-Mode Hot-Start X Cold-Start ___			Federal Tests 1970 ___ 1972 X			Other Tests (specify units and test conditions)			Particulates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ___	CO, ___	NO_x, ___	___
Baseline, as received				2.8	48	6.3				
Baseline, after tune-up	224.4	1.738	1307.8	No tune-up performed.						
Retrofit device test	194.8	0.496	1144.6	1.73	11.1	6.4				
Number of cars	5	5	5	1	1	1				
Test source	Olson Laboratories Dearborn, Michigan			EPA Federal Government Willow Run, Michigan						
Additional test data										
Durability Fleet										

Test Data (Attach Data If Available) Test data attached for Olson Laboratory tests. Test data given for EPA Federal tests at Willow Run are based on results obtained over the phone and only cover one vehicle, a Valient 1970. Other tests were run on a 1963 Chevrolet. All test data have been relayed to Mr. Jose Bascunana.

2.2 Special Reqm'ts., if any (Fuel,Safety)

NONE

For Items 2.3 and 2.4 no formal tests have been run, but no failures of the AVB have ever been reported over the 4 years of sales by Mr. Lökka, Norway.

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source
*		

*Excess of 100,000 miles estimated.

2.4 Maintainability (mean time to repair, MTTR) :

MTTR, Hours			Parts Required for Repair
1.0 HR			

2.5 Periodic Maintenance/Inspection Requirements Inspect air filter and replace if necessary at the normal time of engine air filter inspection. The AVB filter will last as long as the normal engine air filter. 12,000 mi XM

MTTM = 0.5 Hr MMTM

2.5 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make Chrysler Year 1969 Engine CID 383 (2barrel) Transmission M ☐ A ☒

Ambient Temperature 60 c 10:30 a.m.

Car Preparation Data Overnight low 45°F

Basic Ignition Timing 7½ Degrees BTDC

* Point Dwell 26 Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 2.5 sec															
	No. of attempts 1															
	Choke Hi-cam (N) 20 sec	1600	X													
	** Kickdown (N) 10 sec	1500														
	In drive, 10 sec	800	X													
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)															
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)					X										
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)															
	Idle, 15 Seconds	590	X													

Stop Engine, Soak 15 Min, Restart: Start Time 1.5 Sec, Attempts 1

		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	590	X													
	Accel 0-30 (1/2 Throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)															
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)					X										
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)															
	Idle, 15 Seconds	590	X													

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	12.2	12.7	11.8
Decel 60-30, Sec	37.5	36.1	32.9

Comments * 8,000 mi. since last tune-up

** Poor choke kickdown probably due to low ambient and dampness

3. Estimated Cost Information, Dollars

	Cost	Quantity	
3.1 Retrofit System Cost			
. Initial Cost	$40.00	10,000 excluding tooling	
. Developmental/Prototype	Purchased from	Inventor N/A	
. Manufacturing	$8.00	100,000	
. Distribution	$5.00	100,000	
3.2 Profit Margins	15%	100,000	
. Manufacturer	33% ?	Independent	makeup
. Distributor	40% ?	Independent	makeup
. Dealer/Installer (Retail)	40% ?	Independent	makeup
3.3 Installation on Vehicle			
. Kit/Parts	$40 to $48*		
. Labor, Hours	1		

[illegible] Item
Call
?
?

14.8.

*Most cars require kits and parts which cost $40 but special adaptor plates are needed on som cars and prices may be a high as $48 for those kits which include ~~adaptor plates~~ for some 4 barrel carburetors.

Adaptor = 8.00

3.4 Recurring Retrofit Costs

	Baseline	Retrofit
. Fuel Economy, miles/gallon		
City	Higher than	composit.
Highway	Lower than	composit.
Composite	14.75	15.75
. Parts Replacement Cost		$1.50

4. Marketing Information/Plan In the past we have sold the AVB to major fleet owners only. A trainer/installer goes with the first 3-4 units and teaches the fleetowner's mechanics in the installation of the AVB.

We are now setting up a nationwide sales organization including manufacturers reps., warehouse distributors, jobbers, and dealer/installers. Each dealer/installe will be trained in the installation of the AVB. This is part of our sales program. We can not sell the AVB in Californis, but we are presently attempting to obtain permission to do so.

13.20

MFC
40
.33
40
13.20

DIST
40.00
−13.20
26.80
×.40
10.7200

26.80
−10.72
16.08

26.80

RETROFIT INFORMATION OUTLINE

Enclosure 1

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

- Principles of Operation See Enclosure 1 - Memorandum dated June 15, 1971
- Installation Reqm'ts See Note 1, Enclosure 2
- Adjustments See Note 2, Enclosure 2
- MFG Techniques No special required uses - Off-the-shelf parts.

1.2 Development Status

	Number to Date
Conceptual/Design Stage	8
Prototype	3
Manufactured	None
Distributed to Dealer	None
Installed on Vehicles	11
Total Accumulated Miles (Estimated, Thousands)	90,000

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control							
	Induction	Ignition	Combustion	Exhaust	Crankcase Control	Fuel Evap. Control	Exhaust	Crankcase
Hydrocarbon	X							
Carbon Monoxide	X							
Oxides of Nitrogen	X							
Particulates								
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	CM	Ford	Foreign (Specify)
Year (Range)	SEE NOTE 3				
Engine CID (Range)					
Number of Retrofit Model Types to Satisfy Application					

2. Performance Data

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start ____ 7-Mode Cold-Start X			Federal Tests 1970 X 1972 ____			Other Tests (specify units and test conditions)			Particulates
	HC, PPM	CO, %	NO$_x$, PPM	HC, GPM	CO, GPM	NO$_x$, GPM	HC, ___	CO, ___	NO$_x$, ___	____
Baseline, as received										
Baseline, after tune-up	1154	3.203	1157.	12.01	62.54	3.85				
Retrofit device test	729	1.529	823.95	7.59	29.85	2.75				
Number of cars	Test Data is for 1965 Rambler test car, and is typical. Automation Testing Labs.,									
Test source	Aurora Colo.; Marul Schebler Div., Berg-Warner, Deactor, Ill. - See Enclosure 3									
Additional test data										
Durability Fleet	None =	No specific durability fleet testing done to date.								

Test Data (Attach Data If Available) See Enclosure 3

2.2 Special Reqm'ts., if any (Fuel, Safety) No special requirements except initial set up - See Note 2.

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source
See Note 4		

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
See Note 4			

2.5 Periodic Maintenance/ Inspection Requirements See Note 4

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make Rambler Year 65 Engine CID 232 Transmission ☒ M ☐ A

Ambient Temperature 48 °F

Car Preparation Data

Basic Ignition Timing 8 Degrees

Point Dwell 36 Degrees

Other Special Adjustments: Attach Data Sheet None

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 3 sec															
	No. of attempts 1															
	Choke Hi-cam (N) 20 sec	200		X												
	Kickdown (N) 10 sec	350	X													
	In drive, 10 sec		X													
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)														None	
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)							X								
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)														None	
	Idle, 15 Seconds	400	X													

Stop Engine, Soak 15 Min, Restart: Start Time ____ Sec, Attempts ____

		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	400	X													
	Accel 0-30 (1/2 Throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)														None	
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)								X							
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)														None	
	Idle, 15 Seconds	400	X													

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	30	28	27
Decel 60-30, Sec	20	25	24

Comments Slight hesitation off Idle on Rambler

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost	Cost	Quantity	
. Initial Cost	$12,000	Experimental Units	
. Developmental/Prototype	8,000	4 Prototypes & Testing & Evaluation	
. Manufacturing	None		
. Distribution	None		
3.2 Profit Margins			
. Manufacturer	56%	20,000 - 40,000	
. Distributor	30%	20,000 - 40,000	
. Dealer/Installer (Retail)	30%	20,000 - 40,000	
3.3 Installation on Vehicle			
. Kit/Parts	$8.65	20,000 - 40,000	
. Labor, Hours	1.0		
3.4 Recurring Retrofit Costs	Periodic adjustment check (6 Mo.)		
. Fuel Economy, miles/gallon	Baseline	Retrofit	
City	See Enclosure 1 Memo.		1965 Rambler
Highway			1964 Valiant
Composite			1968 Checker
. Parts Replacement Cost	None		

4. Marketing Information/Plan Tentative marketing strategy involves business arrangement with large organization with existing distribution, sales, and field service organization. Under such arrangement would build all or part of the product which would be distribution and serviced by partner organization. Such conversations were held with and resulted in an informal joint venture wherein provides prototype retrofit devices and makes available laboratory test facilities and consulting services, such as those at No final business arrangements have been made or discussed in detail. Part of test data (Enclosure 3) was done at the

ENCLOSURE 2

RETROFIT INFORMATION OUTLINE

NOTE 1 Installation is accomplished by drilling and tapping two holes: one in the top of the carburetor fuel bowl; the second in the intake manifold. In some models of carburetors already present holes can be used.

NOTE 2 Once the system is installed on the carburetor of an automobile an initial adjustment is required to set the system operating at the desired fuel/air ratio. The system is best adjusted initially on a chassis dynammeter. Adjustment is made by opening valve until operation at the desired fuel/air ratio is achieved. In the absence of a chassis dynammeter the system may be adjusted by a single road test wherein, at a steady state cruise condition valve is opened until a slight drop is noted in RPM on mechanics tachometer. From this point valve is slightly closed and locked in position. Specific procedures vary with carburetor model and automobile make and year.

NOTE 3 As far as we can determine the system is applicable to all automobiles or other vehicles utilizing internal combustion gasoline engines having a float/bowl type carburetor. Installations have been made on AMC, Chrysler, GM. Ford, and foreign cars with SU carburetors (TR, MG, Jaguar) and, in one instance a Toyota Land Couiser (jeep type). The system functioned well in all instances. Effect varies with carburetor make and model, and with automobile make and model. Best effects have been noted on older automobiles, pre-1967.

NOTE 4 No durability/reliability testing has been done. Over 90,000 miles of driving has been accumulated on experimental test cars in a fifteen (15) month period. No system failures have occurred. During this period minor maintenance was done on each system - primarily changes is setting to gather data in different full/air ratios. Accordingly it is not practical to sort out that fraction applicable to straight maintenance of the system. Opinion is that negligable maintenance is required.

RETROFIT INFORMATION OUTLINE

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

- Principles of Operation
- Installation Reqm'ts Drilling of air intake manifold
- Adjustments Idle screw for R.P.M.
- MFG Techniques

1.2 Development Status

	Number to Date
Conceptual/Design Stage	
Prototype	X
Manufactured	200
Distributed to Dealer	
Installed on Vehicles	27
Total Accumulated Miles (Estimated, Thousands)	550,000

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combustion	Exhaust				
Hydrocarbon	X							
Carbon Monoxide	X							
Oxides of Nitrogen								
Particulates								
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	CM	Ford	Foreign (Specify)
Year (Range)	1964	1968	1965 & 1967	1965 & 1967	See below
Engine CID (Range)	1956	383	230 389	200 352	
Number of Retrofit Model Types to Satisfy Application	1 only	1 only	1 only	4 only	

4 only - Foreign - Renault 12
1 only - " - Renault 16
1 only - " - Renault 8
1 only - " - Peugot 304
1 only - " - Volkswagon
4 only - " - Fiat 600

2. Performance Data

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test. Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start X 7-Mode Cold-Start ___			Federal Tests 1970 ___ 1972 ___			Other Tests (specify units and test conditions)			Particu-lates
	HC, PPM	CO, %	NO$_x$, PPM	HC, GPM	CO, GPM	NO$_x$, GPM	HC, ___	CO, ___	NO$_x$, ___	___
Baseline, as received	738	9.42					1,100	6.27		
Baseline, after tune-up	No tune up						No tune up			
Retrofit device test	402	1.50					454	2.68		
Number of cars	1 only						1 only			
Test source	Olson Lab. #1-1166,3						Ethyl Corp.			
Additional test data	Pontiac	1967/389 with Tune up. (Olson Lab.)					174	1.00		
Durability Fleet	None					PED Baseline	226	2.29		

Test Data (Attach Data If Available)

2.2 Special Reqm'ts., if any (Fuel,Safety) ______

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source
15,000 +	98%	own

Note: Failure of plugs or points not PED Device.

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours		Parts Required for Repair
0.5 HR MW.		

2.5 Periodic Maintenance/ Inspection Requirements

Check every tune up for CO & HC emissions. Check to see that unit is secure and that there is a vacuum draw from inside ~~air filter.~~

12000 mi

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make Chrysler Year 1968 Engine CID 383 Transmission M ☐ A ☒

Ambient Temperature 68 °F

Car Preparation Data

Basic Ignition Timing 50 Degrees

Point Dwell 28 Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 3 sec															
	No. of attempts 1															
	Choke Hi-cam (N) 20 sec		X													
	Kickdown (N) 10 sec		X													
	In drive, 10 sec			X												
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)															
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)					X										
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)															
	Idle, 15 Seconds	750	X													

Stop Engine, Soak 15 Min, Restart: Start Time 4 Sec, Attempts 2

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	750	X													
	Accel 0-30 (1/2 Throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)	88° F Ambient Temp.				X										
	Decel 55-15 (Mod Brake)															
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)					X										
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)															
	Idle, 15 Seconds	750	X													

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	11	10	9
Decel 60-30, Sec	5	5	5

Comments Car has done 42,794 miles last tune up 28,000 miles.

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost	Cost	Quantity
. Initial Cost	under $10.00	
. Developmental/Prototype	X	
. Manufacturing		
. Distribution		

3.2 Profit Margins

. Manufacturer		
. Distributor		
. Dealer/Installer (Retail)		

3.3 Installation on Vehicle

. Kit/Parts		
. Labor, Hours	1/2 hour	

3.4 Recurring Retrofit Costs

. Fuel Economy , miles/gallon	Baseline	Retrofit
City		Slight improvement
Highway		5 - 7%
Composite		
. Parts Replacement Cost		

4. Marketing Information/Plan

Enclosure 1

RETROFIT INFORMATION OUTLINE

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

- Principles of Operation: See Abstract "A"
- Installation Reqm'ts: See Atachment "B"
- Adjustments: See Atachment "C"
- MFG Techniques: Standard Materials and Techniques

1.2 Development Status

	Number to Date
Conceptual/Design Stage	200
Prototype	40
Manufactured	12
Distributed to Dealer	0
Installed on Vehicles	12
Total Accumulated Miles (Estimated, Thousands)	420 M.

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combus-tion	Exhaust				
Hydrocarbon	x	x						
Carbon Monoxide	x	x						
Oxides of Nitrogen	x	x						
Particulates								
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	CM	Ford	Foreign (Specify)
Year (Range)	All	All	All	All	
Engine CID (Range)	Any	Any	Any	Any	
Number of Retrofit Model Types to Satisfy Application:					

One for each combination of Venturi size and idle mixture screw orifice size.

2. Performance Data

2.1 Exhaust Emission Performance (Avg Value if More than One Test. Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start ____ 7-Mode Cold-Start ____			Federal Tests 1970 ____ 1972 ____			Other Tests (specify units and test conditions)			Particulates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ____	CO, ____	NO_x, ____	____
Baseline, as received										
Baseline, after tune-up										
Retrofit device test										
Number of cars										
Test source										
Additional test data										
Durability Fleet										

Test Data (Attach Data If Available) See attachment "D" dated 9/22/71 - Ref. "ETHYL CORP."

2.2 Special Reqm'ts., if any (Fuel, Safety) None

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source
No failures	100%	See 1.2

(12 vehicles - 420,000 miles)

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
None required			None required

2.5 Periodic Maintenance/ Inspection Requirements None required

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make FORD Year 1967 Engine CID 289 Transmission ☐ ☒

Ambient Temperature 72.5 °F Dry bulb NOTE: See attachment M"D"A.

Car Preparation Data

Basic Ignition Timing ____ Degrees

Point Dwell _____ Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time ____ sec															
	No. of attempts _______															
	Choke Hi-cam (N) 20 sec	☐	☐	☐	☐											
	Kickdown (N) 10 sec	☐	☐	☐	☐											
	In drive, 10 sec	☐	☐	☐	☐											
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☐	☐	☐		
	Accel 30-55 (WOT at Detent)					☐	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☐	☐	☐		
	Accel 15-50 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☐	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	☐	☐	☐	☐											

Stop Engine, Soak 15 Min, Restart: Start Time _____ Sec, Attempts _______

		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	☐	☐	☐	☐											
	Accel 0-30 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☐	☐	☐		
	Accel 30-55 (WOT at Detent)					☐	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☐	☐	☐		
	Accel 15-50 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☐	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	☐	☐	☐	☐											

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec			
Decel 60-30, Sec			

Comments See mass vehicle emission data sheet - ATTACHMENT "D"

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make FORD Year 1967 Engine CID 289 Transmission M ☐ A ☒

Ambient Temperature 57 °F

Car Preparation Data

Basic Ignition Timing 0 Degrees

Point Dwell .017 GAP Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode: Engine RPM	Idle Mode: Satisfactory	Idle Mode: Rough	Idle Mode: Stall	Accel. Mode: Satisfactory	Accel. Mode: Detonation	Accel. Mode: Stretchiness	Accel. Mode: Stumble	Accel. Mode: Hesitation	Accel. Mode: Sag	Cruise: Satisfactory	Cruise: Surging	Cruise: Detonation	Decel: Stall	Decel: Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 4 sec															
	No. of attempts 1															
	Choke Hi-cam (N) 20 sec	1475	✓													
	Kickdown (N) 10 sec	1125	✓													
	In drive, 10 sec	775	✓													
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)															
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)					X										
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)															
	Idle, 15 Seconds	580	✓													

Stop Engine, Soak 15 Min, Restart: Start Time 3 Sec, Attempts 1

		Engine RPM	Satisfactory	Rough	Stall	Accel Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Cruise Satisfactory	Surging	Detonation	Decel Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	580	✓													
	Accel 0-30 (1/2 Throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)															
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)					X										
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)															
	Idle, 15 Seconds	580	✓													

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	12.5	13.1	13.1
Decel 60-30, Sec	34	35	34

Comments

Reproduced from best available copy.

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make FORD Year 1967 Engine CID 289 Transmission ☐ M ☒ A

Ambient Temperature 56 °F

Car Preparation Data

Basic Ignition Timing 6° Degrees

Point Dwel .017 GAP Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode: Engine RPM	Idle Mode: Satisfactory	Idle Mode: Rough	Idle Mode: Stall	Accel. Mode: Satisfactory	Accel. Mode: Detonation	Accel. Mode: Stretchiness	Accel. Mode: Stumble	Accel. Mode: Hesitation	Accel. Mode: Sag	Cruise: Satisfactory	Cruise: Surging	Cruise: Detonation	Decel.: Stall	Decel.: Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 4 sec															
	No. of attempts 1															
	Choke Hi-cam (N) 20 sec	1500	✓	☐	☐											
	Kickdown (N) 10 sec	1100	✓	☐	☐											
	In drive, 10 sec	800	✓	☐	☐											
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☒	☐	☐		
	Accel 30-55 (WOT at Detent)					☒	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☒	☐	☐		
	Accel 15-50 (1/2 Throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☒	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	560	✓	☐	☐											

Stop Engine, Soak 15 Min, Restart: Start Time 3 Sec, Attempts 1

		Idle Mode: Engine RPM	Idle Mode: Satisfactory	Idle Mode: Rough	Idle Mode: Stall	Accel. Mode: Satisfactory	Accel. Mode: Detonation	Accel. Mode: Stretchiness	Accel. Mode: Stumble	Accel. Mode: Hesitation	Accel. Mode: Sag	Cruise: Satisfactory	Cruise: Surging	Cruise: Detonation	Decel.: Stall	Decel.: Backfire
Hot Start Evaluation	Idle, 15 Seconds	560	✓	☐	☐											
	Accel 0-30 (1/2 Throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☒	☐	☐		
	Accel 30-55 (WOT at Detent)					☒	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☒	☐	☐		
	Accel 15-50 (1/2 Throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☒	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	560	✓	☐	☐											

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	12.3	12.9	13
Decel 60-30, Sec	32	34	34

Comments

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost	Cost	Quantity	
. Initial Cost	$50,000.00		
. Developmental/Prototype			
. Manufacturing	$8.00 each	/ 50,000	
. Distribution	unknown		
3.2 Profit Margins before taxes			
. Manufacturer	20%	50,000	
. Distributor			variable based on retail price.
. Dealer/Installer (Retail)			
3.3 Installation on Vehicle			
. Kit/Parts	See 3.2		
. Labor, Hours	.7 hours		aproximate average based of skill.

3.4 Recurring Retrofit Costs		
. Fuel Economy , miles/gallon	Baseline	Retrofit
City	14.0	16.8
Highway	16.0	17.8
Composite	15.0	17.0
. Parts Replacement Cost		NONE

4. Marketing Information/Plan No definite plans at this time.

Enclosure 1

RETROFIT INFORMATION OUTLINE

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

. Principles of Operation SEE PAGES 1 THROUGH 3 ATTACHED

. Installation Reqm'ts

. Adjustments

. MFG Techniques

1.2 Development Status

	Number to Date
Conceptual/Design Stage	
Prototype	3
Manufactured	
Distributed to Dealer	
Installed on Vehicles	
Total Accumulated Miles (Estimated, Thousands)	5,000

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control							
	Induction	Ignition	Combustion	Exhaust	Crankcase Control	Fuel Evap. Control	Exhaust	Crankcase
Hydrocarbon	X	X						
Carbon Monoxide	X							
Oxides of Nitrogen	X	X						
Particulates								
Other								

1.4 Automotive Adaptability (Attach catalog if available) SEE PAGE 3 ATTACHED.

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	CM	Ford	Foreign (Specify)
Year (Range)					
Engine CID (Range)					
Number of Retrofit Model Types to Satisfy Application					

2. Performance Data

2.1 Exhaust Emission Performance (Avg Value if More than One Test. Please Attach Supporting Data).

	Exhaust Emission Measurements, Fill In Applicable Blanks									
Please attach additional test data if available	7-Mode Hot-Start ____ 7-Mode Cold-Start ____			Federal Tests 1970 ____ 1972 ____			Other Tests (specify units and test conditions)			Particulates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ____	CO, ____	NO_x, ____	____
Baseline, as received										
Baseline, after tune-up										
Retrofit device test				SEE ATTACHED DATA FROM OLSON LABORATORIES INC. AND						
Number of cars				TEST PROCEDURE						
Test source										
Additional test data										
Durability Fleet										

Test Data (Attach Data If Available)

2.2 Special Reqm'ts., if any (Fuel, Safety) None

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source

Unknown

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
SEE PAGE #4 OF ATTACHMENT			

2.5 Periodic Maintenance/ Inspection Requirements Annual, or 12000 mile intervals. (Also inspection and/or cleaning is suggested whenever routine carburetor service requires carburetor removal.

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make Chev. Year 1957 Engine CID 283 Transmission ☐ M XXX A

Ambient Temperature 54 °F

Car Preparation Data

Basic Ignition Timing 8 Degrees

Point Dwell 30 Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 6 sec															
	No. of attempts 2															
	Choke Hi-cam (N) 20 sec	830	X													
	Kickdown (N) 10 sec	775	X													
	In drive, 10 sec	650		X												
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)														No	No
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)							X								
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)														No	No
	Idle, 15 Seconds	590	X													

Stop Engine, Soak 15 Min, Restart: Start Time 2 Sec, Attempts 1

		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	600	X													
	Accel 0-30 (1/2 Throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)														No	No
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)					X										
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)														No	No
	Idle, 15 Seconds	595	X													

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	17	15	17
Decel 60-30, Sec	18	20	17

Comments

3. Estimated Cost Information, Dollars

Estimated cost installed to be $55.00 based on active installation and adjustment time of 1.8 hours and normal industry parts and labor profit.

	Cost	Quantity
3.1 Retrofit System Cost		
. Initial Cost		
. Developmental/Prototype		
. Manufacturing		
. Distribution		
3.2 Profit Margins		
. Manufacturer		
. Distributor		
. Dealer/Installer (Retail)		
3.3 Installation on Vehicle		
. Kit/Parts		
. Labor, Hours		

3.4 Recurring Retrofit Costs Unknown

. Fuel Economy, miles/gallon	Baseline	Retrofit
City		
Highway		
Composite		
. Parts Replacement Cost		

4. Marketing Information/Plan Preliminary development stage. Installation will have to be through controlled facilities where equipment and personnel can be relied upon to properly adjust and service the unit. This is not recommended for over the counter sales with no guarantee how it will be installed or adjusted.

1. System Information

1.1 Description - System is composed of a one piece plate to be mounted between carburetor and intake maniford.

In addition to the plate, distributor advance vacuum is disconnected through a standard temperature sensative vacuum switch.

The plate contains:

A - Exhaust gas circuit

B - Filtered air circuit

Both circuits are controlled by identical valves having no moving parts.

The flow through both valves, is regulated by a single sensor having one moving part.

The sensor responds to air flow through the engine. (Not RPM, vacuum, road speed, etc.)

Attached externally to one side of the plate is a dash pot to dampen the "hunting" action of the sensor.

Principles of Operation

EGR Circuit:

Exhaust gases are recirculated into the intake manifold in varying amounts in proportion to the cubic feet of air being consumed by the engine.

The total volume of recirculation can be pre-set for a given engine model before installation.

Since the exhaust gases do not contact any of the metering mechanism, corrosion or scale buildup does not occur to alter metering action with mileage accumulation.

Filtered Air Circuit:

Identical in operation to the E.G.R. Circuit, but with the inclusion of an adjustable needle to regulate, or block, filtered air flow. This circuit is used to lean out the carburetor above idle without having to make internal changes inside the carburetor.

Installation Requirements:

1 - Remove carburetor and mounting studs.

2 - Clean manifold surfaces and install longer studs.

3 - Using new gaskets, slip device plate over studs and reinstall carburetor. (Large majority of engines have existing exhaust holes which will automatically feed exhaust gases into device plate. Those that do not, slip drill template over studs and drill with 3/8" electric drill.)

4 - Inspect and readjust if needed, linkages, shift rods, kick down switches, etc.

5 - If cross-over type choke is used, a choke rod extension is furnished to be snapped onto existing choke rod.

6 - Install vacuum disconnect switch kit and route vacuum hoses to carburetor and distributor. (Note cooling system is not disturbed using this type switch.)

Adjustments:

Factory carburetor and ignition specifications apply with these exceptions:

Carburetor:

Idle speed, auto transmission - In drive factory specs + 50 RPM

Idle speed, standard & overdrive - factory specs + 75 RPM

Idle mixture, using infrared analyzer - .9 to 1.2% CO

Idle mixture, using combustion analyzer - 86%

Idle mixture, using no analyzer - best lean idle (emergency method only.)

Device Plate:

Air adjustment, using dynomometer and analyzer - Follow Clayton Key Mode procedure for "high cruise" while adjusting screw to read CO .8 to 1.0%.

Air adjustment, using only analyzer - 2200 RPM in neutral, adjust to 1.2% ± .1% CO or 87% ± 1% if using combustion analyzer.

Air adjustment, emergency method only - 2200 RPM in neutral, slowly turn air screw out from its seat until lean roughness is detected, turn screw in one full turn.

(Note: Device plate air screw does not operate at curb idle.)

Manufacturing Techniques:

No critical tolerances are necessary with the exception of the sensor which is adjusted to its plate during assembly.

Teflon type coating of exhaust passages and single moving part in sensor.

Temperature sensitive vacuum switch designated to fit one of the open spaces between radiator tubes. It is secured by nylon "T" straps. This leaves the cooling system undisturbed.

1.4 Year range - 1955 - 1970 with engine sizes Classes B through F.

14 basic device plates will cover these engine applications.

Governing factor being the carburetor mounting base configuration.

2.4 Maintainability - One hour to R & R and service.

Parts required, minimum: 2 mounting gaskets
maximum: 2 mounting gaskets
1 dash pot
1 filter element
1 air adjusting needle
1 sensor shaft

Enclosure 1

RETROFIT INFORMATION OUTLINE

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

- . Principles of Operation
- . Installation Reqm'ts
- . Adjustments
- . MFG Techniques

1.2 Development Status

	Number to Date
Conceptual/Design Stage	
✓ Prototype	one
Manufactured	
Distributed to Dealer	
Installed on Vehicles	one
✓ Total Accumulated Miles (Estimated, Thousands)	1500 hours

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combus-tion	Exhaust				
Hydrocarbon				X				
Carbon Monoxide				X				
Oxides of Nitrogen				X				
Particulates				X				
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	CM	Ford	Foreign (Specify)
Year (Range)		1969 Dodge			
Engine CID (Range)		6 (sportsman)			
Number of Retrofit		one			

Model Types to Satisfy Application One model to satisfy all cars.

2. Performance Data

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start ____ 7-Mode Cold-Start ____			Federal Tests 1970 ____ 1972 ____			Other Tests (specify units and test conditions)			Particulates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ____	CO, ____	NO_x, ____	____
Baseline, as received	400	6%								
Baseline, after tune-up										
Retrofit device test	0	0	73.46 less							
Number of cars										
Test source	One car and one test engine									
Additional test data										
Durability Fleet Test Data (Attach Data If Available)										

2.2 Special Reqm'ts., if any (Fuel,Safety) None

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source
No figures		

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
None			

2.5 Periodic Maintenance/ Inspection Requirements One year - and cost is pennies

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make Dodge-Sportsman Year 1969 Engine CID Six Transmission ☐ M ☒ A

Ambient Temperature 68 °F - Engine Temperature 180°F.

Car Preparation Data

Basic Ignition Timing 0 Degrees

Point Dwell 42to47 Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 2 sec															
	No. of attempts 1															
	Choke Hi-cam (N) 20 sec	900	x													
	Kickdown (N) 10 sec	900	x													
	In drive, 10 sec	600														
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					x										
	Cruise 30 (0.1 Mile)											x				
	Accel 30-55 (WOT at Detent)					x										
	Decel 55-15 (Mod Brake)															
	Cruise 15 (0.1 Mile)											x				
	Accel 15-50 (1/2 Throttle)					x										
	Cruise 50 (0.1 Mile)											x				
	Decel 50-0 (Mod Brake)															
	Idle, 15 Seconds	600	x													

Stop Engine, Soak 15 Min, Restart: Start Time ____ Sec, Attempts ____

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	600														
	Accel 0-30 (1/2 Throttle)					x										
	Cruise 30 (0.1 Mile)											x				
	Accel 30-55 (WOT at Detent)					x										
	Decel 55-15 (Mod Brake)															
	Cruise 15 (0.1 Mile)											x				
	Accel 15-50 (1/2 Throttle)					x										
	Cruise 50 (0.1 Mile)											x				
	Decel 50-0 (Mod Brake)															
	Idle, 15 Seconds															

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	27	23	20
Decel 60-30, Sec	22	25	27

Comments With the unit installed.

26	31	29
26	24	27

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost

	Cost	Quantity
. Initial Cost	None Available	
. Developmental/Prototype	Not Known	One
. Manufacturing	Not Known	Not Known
. Distribution	None	None

3.2 Profit Margins

. Manufacturer	None Available	
. Distributor	None	
. Dealer/Installer (Retail)	None	

3.3 Installation on Vehicle

. Kit/Parts	Not Known	Not Known
. Labor, Hours	Not Known	Not Known

3.4 Recurring Retrofit Costs

Information according to test conducted

Fuel Economy, miles/gallon		Baseline	Retrofit	
City	Without Unit	10.2 mpg 7 stops	17.8 mpg 8 stops	With Unit
Highway	Without Unit	17.1 mpg	15.6 mpg	With Unit
Composite				
. Parts Replacement Cost			Not Known	

4. Marketing Information/Plan To be sold to new car manufacturers, as well as used cars now on the road.

2. **Performance Data** on 1964 Plymouth, 318 C.I.D., Auto. Trans., 3500 lb

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

Please attach — additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start X 7-Mode Cold-Start ___			Cold Start Federal Tests 1970 FTP 1972 ___			Other Tests (specify units and test conditions)			Particulates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ___	CO, ___	NO_x, ___	___
Baseline, as received	323.2	0.85	1930	3.96	30.63	6.09				
Baseline, after tune-up	315.8	1.41	1305	3.90	40.54	4.51				
Retrofit device test	95.1	.75	472	1.46	26.46	1.64				
Number of cars										
Test source	Carter Carburetor Division, ACF Industries, Inc. Emission Laboratory									
Additional test data										
Durability Fleet										

Test Data (Attach Data If Available)

2.2 Special Reqm'ts., if any (Fuel, Safety) None

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair

2.5 Periodic Maintenance/ Inspection Requirements

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make Plymouth Year 1964 Engine CID 318 Transmission ☐ M ☒ A

Ambient Temperature 75 °F

Car Preparation Data

Basic Ignition Timing 10 Degrees

Point Dwell - Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 2 sec															
	No. of attempts 1															
	Choke Hi-cam (N) 20 sec	1100	☒	☐	☐											
	Kickdown (N) 10 sec	-	☒	☐	☐											
	In drive, 10 sec	-	☒	☐	☐											
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☒	☐	☐		
	Accel 30-55 (WOT at Detent)					☒	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☒	☐	☐		
	Accel 15-50 (1/2 Throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☒	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	550	☒	☐	☐											

Stop Engine, Soak 15 Min, Restart: Start Time 2 Sec, Attempts 1

		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	500	☒	☐	☐											
	Accel 0-30 (1/2 Throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☒	☐	☐		
	Accel 30-55 (WOT at Detent)					☒	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☒	☐	☐		
	Accel 15-50 (1/2 Throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☒	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	550	☒	☐	☐											

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	None		
Decel 60-30, Sec	None		

Comments Driveability was not significantly affected by the emission control kit. No effect at W.O.T.

2. Performance Data on 1965 Chevrolet, 283 C.I.D., Auto. Trans., 4000 lb Weight **Enclosure 1 cont.**

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

	Exhaust Emission Measurements, Fill In Applicable Blanks									
Please attach additional test data if available	7-Mode Hot-Start X 7-Mode Cold-Start ___			Cold Start Federal Tests 1970 FTP 1972 ___			Other Tests (specify units and test conditions)			Particulates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ___	CO, ___	NO_x, ___	___
Baseline, as received	395.1	2.75	820							
Baseline, after tune-up	398.1	2.90	836	5.67	82.13	3.04				
Retrofit device test	170.3	1.18	800	2.58	39.40	2.98				
Number of cars										
Test source	Carter Carburetor Division, ACF Industries, Inc.									
Additional test data										
Durability Fleet Test Data (Attach Data If Available)										

2.2 Special Reqm'ts., if any (Fuel, Safety)____________________

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair

2. Performance Data on 1966 Ford, 289 C.I.D., Auto. Trans., 3500 lb

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

Please attach additional test data if - available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start X 7-Mode Cold-Start ___			Cold Start Federal Tests 1970 FTP 1972 ___			Other Tests (specify units and test conditions)			Particu-lates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ___	CO, ___	NO_x, ___	___
Baseline, as received	361.0	2.44	1430	4.64	51.91	4.83				
Baseline, after tune-up	294.7	2.12	1095	3.71	46.00	3.52				
Retrofit device test	163.1	1.15	538	2.13	27.18	1.81				
Number of cars										
Test source	Carter Carburetor Division, ACF Industries, Inc.									
Additional test data										
Durability Fleet										

Test Data (Attach Data If Available)

2.2 Special Reqm'ts., if any (Fuel,Safety) ______

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair

2.5 Periodic Maintenance/ Inspection Requirements ______

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make Chevrolet Year 1965 Engine CID 283 Transmission M ☐ A ☒

Ambient Temperature 75 °F

Car Preparation Data

Basic Ignition Timing 4 Degrees

Point Dwell ____ Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 2 sec															
	No. of attempts 1															
	Choke Hi-cam (N) 20 sec	1300	☒	☐	☐											
	Kickdown (N) 10 sec	-	☒	☐	☐											
	In drive, 10 sec	-	☒	☐	☐											
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☒	☐	☐		
	Accel 30-55 (WOT at Detent)					☒	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☒	☐	☐		
	Accel 15-50 (1/2 Throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☒	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	600	☒	☐	☐											

Stop Engine, Soak 15 Min, Restart: Start Time 2 Sec, Attempts 1

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	550	☒	☐	☐											
	Accel 0-30 (1/2 Throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☒	☐	☐		
	Accel 30-55 (WOT at Detent)					☒	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☒	☐	☐		
	Accel 15-50 (1/2 Throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☒	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	600	☒	☐	☐											

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	None		
Decel 60-30, Sec	None		

Comments Driveability was not significantly affected by the emission control kit.

No effect at W.O.T.

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make Ford Year 1966 Engine CID 289 Transmission ☐ ☒
M A

Ambient Temperature 75 °F

Car Preparation Data

Basic Ignition Timing 6 Degrees

Point Dwell - Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 2 sec															
	No. of attempts 1															
	Choke Hi-cam (N) 20 sec	1150	X													
	Kickdown (N) 10 sec	-	X													
	In drive, 10 sec	-	X													
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)							X								
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)															
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)							X								
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)															
	Idle, 15 Seconds	560	X													

Stop Engine, Soak 15 Min, Restart: Start Time 2 Sec, Attempts 1

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	500	X													
	Accel 0-30 (1/2 Throttle)							X								
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)															
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)							X								
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)															
	Idle, 15 Seconds	560	X													

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	None		
Decel 60-30, Sec	None		

Comments Stretchiness noted on part throttle accels under 30 mph; also noted to lesser extent without emissions kit. No effect on W.O.T.

RETROFIT INFORMATION OUTLINE

Enclosure 1

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

. Principles of Operation see attached "Operation and Installation" booklet

. Installation Reqm'ts Can be customer installed in about 5 minutes

. Adjustments see p. 20 of "Operation and Installation" booklet

. MFG Techniques

1.2 Development Status

	Number to Date
Conceptual/Design Stage	
Prototype	
Manufactured	150 000
Distributed to Dealer	175 000
Installed on Vehicles	150,000
Total Accumulated Miles (Estimated, Thousands)	75,000,000

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combustion	Exhaust				
Hydrocarbon								
Carbon Monoxide								
Oxides of Nitrogen			No modifications required					
Particulates								
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	GM	Ford	Foreign (Specify)
Year (Range)	our one model fits all these				
Engine CID (Range)	our one model fits all these				
Number of Retrofit	our one model fits all these				

Model Types to Satisfy one

Application Instructions apply to 4 or less cylinders, 6 cylinders and 8 cylinder engines . Pages 19,20 in booklet.

2. Performance Data

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start ____ 7-Mode Cold-Start ____			Federal Tests 1970 ____ 1972 ____			Other Tests (specify units and test conditions)			Particu-lates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ____	CO, ____	NO_x, ____	____
Baseline, as received										
Baseline, after tune-up										
Retrofit device test										
Number of cars										
Test source										
Additional test data										
Durability Fleet										

Test Data (Attach Data If Available)

2.2 Special Reqm'ts., if any (Fuel,Safety) ____

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
0			none

2.5 Periodic Maintenance/ Inspection Requirements none

Check to see if all capacitor blocks are securely attached to ignition wires every 2500 miles.

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make FORD Year '70 Engine CID 390 Transmission M ☐ A X

Ambient Temperature 75 °F

Car Preparation Data

Basic Ignition Timing 9° BTDC Degrees

Point Dwell 26 Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 3 sec															
	No. of attempts 1															
	Choke Hi-cam (N) 20 sec	1120	X	☐	☐											
	Kickdown (N) 10 sec	900	X	☐	☐											
	In drive, 10 sec	860	X	☐	☐											
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					X	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											X	☐	☐		
	Accel 30-55 (WOT at Detent)					X	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											X	☐	☐		
	Accel 15-50 (1/2 Throttle)					X	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											X	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	650	X	☐	☐											

Stop Engine, Soak 15 Min, Restart: Start Time 5 Sec, Attempts 1

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	710	X	☐	☐											
	Accel 0-30 (1/2 Throttle)					X	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											X	☐	☐		
	Accel 30-55 (WOT at Detent)					X	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											X	☐	☐		
	Accel 15-50 (1/2 Throttle)					X	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											X	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	650	X	☐	☐											

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	9.2	9	9
Decel 60-30, Sec			

Comments

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost	Cost	Quantity
. Initial Cost	$10.00	1 retail
. Developmental/Prototype		
. Manufacturing	2.50	
. Distribution	5.00	
3.2 Profit Margins		
. Manufacturer	1.00	
. Distributor	3.50	
. Dealer/Installer (Retail)	4.00	
3.3 Installation on Vehicle		
. Kit/Parts	-0-	
. Labor, Hours	customer installed in 5 minutes	

3.4 Recurring Retrofit Costs		
. Fuel Economy, miles/gallon	Baseline	Retrofit
City	10	11
Highway	12	14
Composite	11	12½
. Parts Replacement Cost		-0-

4. Marketing Information/Plan We are setting up a system of protected area distributors who service the retail outlets within a specified area. Also, we sell direct to national interstate accounts. This is a relatively inexpensive marketing system. At the present time, our low retail is $19.95 and the high is $29.95. It's a matter of supply and demand. As indicated above, it could be sold for much less.

Enclosure 1

RETROFIT INFORMATION OUTLINE

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

. Principles of Operation)
. Installation Reqm'ts) See attachment.
. Adjustments)
. MFG Techniques

1.2 Development Status

	Number to Date
Conceptual/Design Stage	-
Prototype	-
Manufactured	100
Distributed to Dealer	-0-
Installed on Vehicles	62
Total Accumulated Miles (Estimated, Thousands)	190,000

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combus-tion	Exhaust				
Hydrocarbon				X				
Carbon Monoxide				X				
Oxides of Nitrogen				X				
Particulates								
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	CM	Ford	Foreign (Specify)
Year (Range)	} All				
Engine CID (Range)					
Number of Retrofit Model Types to Satisfy Application	-	6	12	7	5 Fiat VW Volvo Toyota Datsun

2. Performance Data

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test. Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start x 7-Mode Cold-Start ___			Federal Tests 1970 ___ 1972 x			Other Tests (specify units and test conditions)			Particu-lates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ___	CO, ___	NO_x, ___	___
Baseline, as received	-	-	-			-				
Baseline, after tune-up	740	2.8	1360	7.5	95	-				
Retrofit device test	345	.8	520	5.8	38	-				
Number of cars	2	2	2	1	1	-				
Test source	LABORATORY TEST AT UOP									
Additional test data	none	-				-				
Durability Fleet	see 2.3									

Test Data (Attach Data If Available)

2.2 Special Reqm'ts., if any (Fuel,Safety) Fuel must not contain Phosphorus additives.

Safety - see attachment.

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source
12500	95%	UOP data

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours	MMBM		Parts Required for Repair
12500 —	95%	UOP data	Replace catalyst.

MTR - 0.25 hr

2.5 Periodic Maintenance/ Inspection Requirements Above. 25,000 miles can be projected in 2.3 and 2.4 to a 75% confidence level.

This is an extrapolation based on performance level in 12,000 mile tests at UOP.

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make Chevrolet Year 1961 Engine CID 283 Transmission M ☐ A ☒

Ambient Temperature 57 °F

Car Preparation Data

Basic Ignition Timing 4° Degrees

Point Dwell 29 Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time ____ sec															
	No. of attempts ____															
	Choke Hi-cam (N) 20 sec	1100	X													
	Kickdown (N) 10 sec	700	X													
	In drive, 10 sec	600	X													
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)															
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)					X										
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)															
	Idle, 15 Seconds	565	X													

Stop Engine, Soak 15 Min, Restart: Start Time 2 Sec, Attempts 1

		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds															
	Accel 0-30 (1/2 Throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)															
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)					X										
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)															
	Idle, 15 Seconds	475	X													

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	16.7	17.0	17.0
Decel 60-30, Sec	26.0	23.0	25.0

Comments Performance acceptable in all modes.

Enclosure 1 cont.

	6 Cylinder Cars 1-44 in^3 Converter		8 Cylinder Cars 2-30 in^3 Converter
3. Estimated Cost Information, Dollars			
3.1 Retrofit System Cost	Cost	Quantity	
. Initial Cost			
. Developmental/Prototype			
. Manufacturing			
. Distribution	≃$30 ea*	100,000 units	≃$50/2-units* 100,000unit
3.2 Profit Margins			
. Manufacturer			
. Distributor			
. Dealer/Installer (Retail)			
3.3 Installation on Vehicle			
. Kit/Parts		} $10/vehicle*	} $15/vehicle*
. Labor, Hours			
3.4 Recurring Retrofit Costs			
. Fuel Economy, miles/gallon	Baseline	Retrofit	
City			
Highway			
Composite			
. Parts Replacement Cost		$15 refill*	$20 refill*

4. Marketing Information/Plan *Prices assume quantity sale to State or Municipal Programs. Installation costs are those quoted by established muffler shops for complete installation of ~~converter and~~ piping. State and Municipal Governments ~~should be able to~~ negotiate equivalent or lower prices from certified or contract installers. Price does not include cost of lean-tuning and vehicle inspection. This is a prerequisite to a successful catalytic retrofit program. However, it is also an essential ~~and separate first~~ step in any automotive emission control program whether catalysts are specified or not.

RETROFIT INFORMATION OUTLINE

Enclosure 1

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

- Principles of Operation Crankcase Ventilation -See Attached Brochure
- Installation Reqm'ts Installation Instructions w/each Kit
- Adjustments Carb idle if necessary
- MFG Techniques

1.2 Development Status

Development Status	Number to Date	
Conceptual/Design Stage	Completed	1933
Prototype	"	"
Manufactured	Since 1935	
Distributed to Dealer	500,000 ESTIMATED SALES TO DATE	
Installed on Vehicles	200,000 ESTIMATED SALES TO DATE on cars & Trucks	
Total Accumulated Miles (Estimated, Thousands)	UNKNOWN	

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combus-tion	Exhaust				
Hydrocarbon					✓			
Carbon Monoxide					✓			
Oxides of Nitrogen					✓			
Particulates								
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	CM	Ford	Foreign (Specify)
Year (Range)	1955 -1971	1955 -1971	1955 -1971	1955 -1971	
Engine CID (Range)	140 UP	140 UP	140 UP	140 UP	
Number of Retrofit	21	47	103	61	

Model Types to Satisfy ALL

Application ALL

2. Performance Data

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start ____ 7-Mode Cold-Start ____			Federal Tests 1970 ____ 1972 ____			Other Tests (specify units and test conditions)			Particu-lates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ____	CO, ____	NO_x, ____	____
Baseline, as received										
Baseline, after tune-up										
Retrofit device test										
Number of cars										
Test source										
Additional test data										
Durability Fleet										

Test Data (Attach Data If Available) See attached

2.2 Special Reqm'ts., if any (Fuel, Safety) NONE

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source
No FAILURES		

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
5 Min			VAPOR FILTER ELEMENT

2.5 Periodic Maintenance/ Inspection Requirements See attached Service bulletin

2.6 Drivability Evaluation-Retrofit Device installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page a.

Make CADILLAC Year 1972 Engine CID 472 Transmission ☐ M ☒ A

Ambient Temperature 40 °F

Car Preparation Data

Basic Ignition Timing 8 Degrees

Point Dwell 30 Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 6 sec															
	No. of attempts 2															
	Choke Hi-cam (N) 20 sec	1200		X												
	Kickdown (N) 10 sec	1000		X												
	In drive, 10 sec	760	X													
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)															
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)					X										
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)															
	Idle, 15 Seconds	640	X													

Stop Engine, Soak 15 Min, Restart: Start Time 2 Sec, Attempts 1

		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	620	X													
	Accel 0-30 (1/2 Throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)															
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)					X										
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)															
	Idle, 15 Seconds	680	X													

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	10	10	10
Decel 60-30, Sec	33	32	35

Comments **Engine equipped with AC valve as received from the factory. Engine tuned to factory specifications and no further adjustments were made.**

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make CADILLAC Year 1972 Engine CID 472 Transmission ☐ M ☒ A

Ambient Temperature 38 °F

Car Preparation Data

Basic Ignition Timing 8 Degrees

Point Dwell 30 Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfact	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 4 sec															
	No. of attempts 1															
	Choke Hi-cam (N) 20 sec	1300	X	☐	☐											
	Kickdown (N) 10 sec	1100	☐	X	☐											
	In drive, 10 sec	900	X	☐	☐											
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					X	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											X	☐	☐		
	Accel 30-55 (WOT at Detent)					X	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											X	☐	☐		
	Accel 15-50 (1/2 Throttle)					X	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											X	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	650	X	☐	☐											

Stop Engine, Soak 15 Min, Restart: Start Time 2 Sec, Attempts 1

		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfact	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	720	X	☐	☐											
	Accel 0-30 (1/2 Throttle)					X	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											X	☐	☐		
	Accel 30-55 (WOT at Detent)					X	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											X	☐	☐		
	Accel 15-50 (1/2 Throttle)					X	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											X	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	650	X	☐	☐											

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	10	10	10
Decel 60-30, Sec	34	35	35

Comments Engine was set to manufacture specifications and no further adjustments were made, after installation of the System.

Enclosure 1 cont.

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost	Cost	Quantity
. Initial Cost	$30 to $50	
. Developmental/Prototype		
. Manufacturing		
. Distribution		

3.2 Profit Margins		
. Manufacturer		
. Distributor		
. Dealer/Installer (Retail)		

3.3 Installation on Vehicle		
. Kit/Parts	$30 to 50	
. Labor, Hours	30 Min to 1 hr	

3.4 Recurring Retrofit Costs		
. Fuel Economy, miles/gallon	Baseline	Retrofit
City		
Highway		
Composite		
. Parts Replacement Cost		$1,50

4. Marketing Information/Plan Thru Dealers, Jobbers & Distributors & Some OEM.

Enclosure 1

RETROFIT INFORMATION OUTLINE

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

. Principles of Operation Exhaust Filtering System

. Installation Reqm'ts Replaces standard exhaust system,

. Adjustments NONE

. MFG Techniques ______

1.2 Development Status

	Number to Date
Conceptual/Design Stage	3
Prototype	3
Manufactured	0
Distributed to Dealer	0
Installed on Vehicles	3
Total Accumulated Miles (Estimated, Thousands)	28,000

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control							
	Induction	Ignition	Combustion	Exhaust	Crankcase Control	Fuel Evap. Control	Exhaust	Crankcase
Hydrocarbon				X				
Carbon Monoxide				X				
Oxides of Nitrogen								
Particulates				X				
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	CM	Ford	Foreign (Specify)
Year (Range)	most	most	most	most	
Engine CID (Range)					
Number of Retrofit Model Types to Satisfy Application	"	"	"	"	

Enclosure 1 cont.

2. Performance Data

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start ✓ 7-Mode Cold-Start ___			Federal Tests 1970 ___ 1972 ___			Other Tests (specify units and test conditions)			Suspened Particulates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ___	CO, ___	NO_x, ___	gm/mi
Baseline, as received	206	0.6%	935	2.8	15.4	3.9				0.034 COLD 0.029 Hot
Baseline, after tune-up										
Retrofit device test	168	1.03	1047	2.58	47.78	5.87				0.090 COLD 0.028 Hot
Number of cars	1									
Test source	1970 OLdSmobile, tested at Ethyl CORP									
Additional test data										
Durability Fleet										

Test Data (Attach Data If Available) *Ethyl Black BAG Procedure, FouR Hot-Starts 7-mode Cycles

2.2 Special Reqm'ts., if any (Fuel, Safety)

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair

2.5 Periodic Maintenance/ Inspection Requirements Same AS Normal Exhaust

Enclosure 1 Cont.

SEP 8 [illegible]

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make OLDS Year 1970 Engine CID 455 Transmission ☐ M ☒ A

Ambient Temperature ______ °F

Car Preparation Data

Basic Ignition Timing 5 Degrees

Point Dwell 30 Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 20 sec															
	No. of attempts 1															
	Choke Hi-cam (N) 20 sec	500	✓													
	Kickdown (N) 10 sec	500	✓													
	In drive, 10 sec		✓													
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					✓	OK	OK	✓	OK	OK					
	Cruise 30 (0.1 Mile)											OK	OK	OK		
	Accel 30-55 (WOT at Detent)					OK	OK	OK	OK	OK	OK					
	Decel 55-15 (Mod Brake)														OK	OK
	Cruise 15 (0.1 Mile)											OK	OK	OK		
	Accel 15-50 (1/2 Throttle)					OK	OK	OK	OK	OK	OK					
	Cruise 50 (0.1 Mile)											OK	OK	OK		
	Decel 50-0 (Mod Brake)														OK	OK
	Idle, 15 Seconds		OK													

Stop Engine, Soak 15 Min, Restart: Start Time 10 Sec, Attempts ONE

		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds		OK	OK	OK											
	Accel 0-30 (1/2 Throttle)					OK	OK	OK	OK	OK	OK					
	Cruise 30 (0.1 Mile)											OK	OK	OK		
	Accel 30-55 (WOT at Detent)					OK	OK	OK	OK	OK	OK					
	Decel 55-15 (Mod Brake)														OK	OK
	Cruise 15 (0.1 Mile)											OK	OK	OK		
	Accel 15-50 (1/2 Throttle)					OK	OK	OK	OK	OK	OK					
	Cruise 50 (0.1 Mile)											OK	OK	OK		
	Decel 50-0 (Mod Brake)														OK	OK
	Idle, 15 Seconds		OK	OK	OK											

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	OK	OK	OK
Decel 60-30, Sec	OK	OK	OK

Comments

N/A

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost	Cost	Quantity
. Initial Cost	$85.00	1
. Developmental/Prototype	$1,000	1
. Manufacturing	NO INFORMATION	
. Distribution	" "	

3.2 Profit Margins		
. Manufacturer		
. Distributor		
. Dealer/Installer (Retail)		

3.3 Installation on Vehicle		
. Kit/Parts	NO INFORMATION	
. Labor, Hours	" "	

3.4 Recurring Retrofit Costs . Fuel Economy, miles/gallon	Baseline	Retrofit
City	standard cost	
Highway	" "	
Composite		
. Parts Replacement Cost	NO INFORMATION	

4. Marketing Information/Plan Developing

RETROFIT INFORMATION OUTLINE

Enclosure 1

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

- Principles of Operation see attached enclosure
- Installation Reqm'ts see notes 1-2-3-4 attached layout drawing
- Adjustments flow control, valves/use performance engine analyzer
- MFG Techniques Cold forming process - heat transfer, [illegible]

Remainder of system parts can be purchased

1.2 Development Status

	Number to Date
Conceptual/Design Stage	5
Prototype	1
Manufactured	NONE
Distributed to Dealer	NONE
Installed on Vehicles	1
Total Accumulated Miles (Estimated, Thousands)	16,000

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combus-tion	Exhaust				
Hydrocarbon	✓	✓	✓	✓	✓	✓		✓
Carbon Monoxide	✓	✓	✓	✓	✓	✓		✓
Oxides of Nitrogen	✓	✓	✓	✓	✓	✓		✓
Particulates	✓	✓	✓	✓	✓	✓		✓
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	CM	Ford	Foreign (Specify)
Year (Range)	1955 to 71	1955 to 71	1955 to 71	1955 to 71	
Engine CID (Range)	199 to 401	97 - 383	97 to 455	170 - 429	
Number of Retrofit Model Types to Satisfy Application	6	6	6	6	

2. Performance Data

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

See attached data in [illegible]

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start ✓ 7-Mode Cold-Start ✓			Federal Tests [✓ 1970] 1972			Other Tests (specify units and test conditions)			Particulates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC,	CO,	NO_x, NO_2	
Baseline, as received										
Baseline, after tune-up										
Retrofit device test	188	.059	704	556	2.3	716			13	
Number of cars	1	1	1	1	1	1				
Test source	Scott Resh. Lab, – Calif. air Resources Lab. – O.L.I. Laboratories, Inc.									
Additional test data										
Durability Fleet										

Test Data (Attach Data If Available)

2.2 Special Reqm'ts., if any (Fuel, Safety) Engine ignition Coil replaced, with 12Volt heavy duty wet ignation Coil to improve the Combustion and to Reduce nitrogen oxides.

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source

none available at present time

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
½ hr.			none to ~~this~~ date

2.5 Periodic Maintenance/ Inspection Requirements Every 10,000 miles, remove filtering unit from Micro clean filter unit and blow out accumulated particulates with compressed air. Every 2000 miles remove carburetor air cleaner filter, use compressed air to blow-off accumulated particulates and dirt, replace air filter after 5,000 miles

Enclosure 1 Cont.

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make FORD FALCON Year 1965 Engine CID 200 Transmission ☐ M ☑ A

Ambient Temperature 70 °F

Car Preparation Data

Basic Ignition Timing 12 Degrees

Point Dwell 36 Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 5 sec															
	No. of attempts 1															
	Choke Hi-cam (N) 20 sec	700	☑	☐	☐											
	Kickdown (N) 10 sec	600	☑	☐	☐											
	In drive, 10 sec	550	☑	☐	☐											
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					☑	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☑	☐	☐		
	Accel 30-55 (WOT at Detent)					☑	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☑	☐	☐		
	Accel 15-50 (1/2 Throttle)					☑	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☑	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	550	☑	☐	☐											

Stop Engine, Soak 15 Min, Restart: Start Time 5 Sec, Attempts 1

		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	550	☑	☐	☐											
	Accel 0-30 (1/2 Throttle)					☑	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☑	☐	☐		
	Accel 30-55 (WOT at Detent)					☑	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☑	☐	☐		
	Accel 15-50 (1/2 Throttle)					☑	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☑	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	550	☑	☐	☐											

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	✓		
Decel 60-30, Sec	✓		

Comments

Enclosure 1 cont.

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost

	Cost	Quantity
. Initial Cost	125.00	1
. Developmental/Prototype	40,000.	1
. Manufacturing	NONE	
. Distribution	NONE	

3.2 Profit Margins

. Manufacturer	NONE	
. Distributor	NONE	
. Dealer/Installer (Retail)	175.00	1

3.3 Installation on Vehicle

. Kit/Parts (carb. assy. units)	15.00	1
. Labor, Hours	25.00	1

3.4 Recurring Retrofit Costs

	Baseline	Retrofit
. Fuel Economy , miles/gallon		
City	16 MI. PE. GAL	20 MIL PER GAL
Highway	20 MI. PER GAL	25 MI. PER GAL
Composite		
. Parts Replacement Cost		

LEADED OR NONLEADED FUEL

4. Marketing Information/Plan NONE AT PRESENT TIME

RETROFIT INFORMATION OUTLINE

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

- Principles of Operation Sealed negative pressure Crankcase
- Installation Reqm'ts Ventilation System. Mount at any desirable location
- Adjustments 5" Vacuum during Idle (warm) Neutral.
- MFG Techniques

1.2 Development Status

	Number to Date
Conceptual/Design Stage	—
Prototype	← 2 Types. (½ - ¼)
Manufactured	
Distributed to Dealer	7500
Installed on Vehicles	7000
Total Accumulated Miles (Estimated, Thousands)	5,000,000

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combus-tion	Exhaust				
Hydrocarbon								✓
Carbon Monoxide								
Oxides of Nitrogen			✓					
Particulates								
Other	Closed Crankcase Ventn. System - Adjustable							

'control of Crankcase Emissions Through the Use of (2-Orifice) Flow / Negative crankcase pressure
RW McClones - J. W. Hiron - SAE 660547

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	GM	Ford	Foreign (Specify)
Year (Range)	1966	1959-66	1959-68	1961-1967	61-68
Engine CID (Range)	All	ALL	ALL	ALL	10%
Number of Retrofit Model Types to Satisfy Application	1	7	8	6	2

Variable Orifice to control Blowby flow kind

2. Performance Data

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start 7-Mode Cold-Start X			Federal Tests 1970 ___ 1972 ___			Other Tests (specify units and test conditions)			Particulates
	HC, PPM	CO, %	NOx, PPM	HC, GPM	CO, GPM	NOx, GPM	HC, ___	CO, ___	NOx, ___	___
Baseline, as received										
Baseline, after tune-up	525 ppm	367%	1352 ppm							
Retrofit device test	457 ppm	439%	962 ppm							
Number of cars	2 Vehicles Test Data.									
Test source	Scott Research Laboratories - San Bernardino, Calif.									
Additional test data										
Durability Fleet	8 Vehicle Fleet									

Test Data (Attach Data If Available)

2.2 Special Reqm'ts., if any (Fuel, Safety) None Required Other than adjustment Tool.

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source
10000	95%	EST.

No Failures Reported

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
7 1/4 Hr.			PCV cleaning (flush)

2.5 Periodic Maintenance/Inspection Requirements 1 year - 12,000 Mi 15 minutes.

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make ___________ Year_______ Engine CID________Transmission ☐ M ☐ A

Ambient Temperature ______°F

Car Preparation Data

Basic Ignition Timing ____Degrees

Point Dwell _____Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time_____sec															
	No. of attempts_______															
	Choke Hi-cam (N) 20 sec	☐	☐	☐	☐											
	Kickdown (N) 10 sec	☐	☐	☐	☐											
	In drive, 10 sec	☐	☐	☐	☐											
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☐	☐	☐		
	Accel 30-55 (WOT at Detent)					☐	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☐	☐	☐		
	Accel 15-50 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☐	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	☐	☐	☐	☐											

Stop Engine, Soak 15 Min, Restart: Start Time______Sec, Attempts _______

		Idle Mode				Accel. Mode						Cruise			Decel	
Hot Start Evaluation	Idle, 15 Seconds	☐	☐	☐	☐											
	Accel 0-30 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☐	☐	☐		
	Accel 30-55 (WOT at Detent)					☐	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☐	☐	☐		
	Accel 15-50 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☐	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	☐	☐	☐	☐											

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec			
Decel 60-30, Sec			

Comments Satisfactory performance all (8) Vehicles on 12000 mile durability Test May 1965

Enclosure 1 cont.

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost	Cost	Quantity
. Initial Cost	~~[illegible]~~	100,000 units.
. Developmental/Prototype	1.21	
. Manufacturing	4.85	
. Distribution	8.36	

3.2 Profit Margins		
. Manufacturer		
. Distributor		
. Dealer/Installer (Retail)		

3.3 Installation on Vehicle		
. Kit/Parts	14 4/x	~~100,000~~ units. , 7 Models.
. Labor, Hours	1-1/2 Hr.	each

3.4 Recurring Retrofit Costs	Baseline	Retrofit
. Fuel Economy , miles/gallon		
City		
Highway		
Composite	No DATA	No DATA.
. Parts Replacement Cost		

4. Marketing Information/Plan Marketing through Standard Automotive trade -

Enclosure 1

RETROFIT INFORMATION OUTLINE

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

- Principles of Operation SEE ENCLOSURE I
- Installation Reqm'ts
- Adjustments
- MFG Techniques

1.2 Development Status

Development Status	Number to Date
Conceptual/Design Stage	—
Prototype	25
Manufactured	–
Distributed to Dealer	–
Installed on Vehicles	75
Total Accumulated Miles (Estimated, Thousands)	200

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combus-tion	Exhaust				
Hydrocarbon	✓	✓						
Carbon Monoxide	✓							
Oxides of Nitrogen		✓						
Particulates								
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	GM	Ford	Foreign (Specify)
Year (Range)	55-65	55-65	55-65	55-65	
Engine CID (Range)	OVER 140	OVER 140	OVER 140	OVER 140	
Number of Retrofit Model Types to Satisfy Application		(1 TOTAL)			

2. Performance Data

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start ① 7-Mode Cold-Start ②			Federal Tests 1970 ___ 1972 ___			Other Tests (specify units and test conditions)			Particu-lates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ___	CO, ___	NO_x, ___	___
① Baseline, as received	696	3.25	1170							
Baseline, after tune-up										
② Retrofit device test **	224	1.54	533							
Number of cars										
Test source	OLSON LABS									
Additional test data										
② Durability Fleet *	235	1.50	538							

Test Data (Attach Data If Available) * TEST VALUES @ 25,000 MILES — 4 CAR AVERAGE
** ZERO MILE AVERAGES — 17 TEST VEHICLES.

2.2 Special Reqm'ts., if any (Fuel, Safety) NONE

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source
75,000	100 %	ECT

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
.75			NEW UNIT

UNIT WILL BE REPLACED IN FIELD, NOT REPAIRED.

2.5 Periodic Maintenance/ Inspection Requirements NO PERIODIC MAINTANANCE ON DEVICE — VEHICLE SHOULD HAVE STANDARD PERIODIC MAINTANANCE TO MAXIMIZE EMISSION/PERFORMANCE EFFECTIVENESS. INSPECTION SHOULD BE MADE TO INSURE DEVICE UTILIZATION.

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost	Cost	Quantity
. Initial Cost (TOTAL)	$40	100,000
. Developmental/Prototype		
. Manufacturing		
. Distribution		

3.2 Profit Margins		
. Manufacturer		
. Distributor		
. Dealer/Installer (Retail)	$20	

3.3 Installation on Vehicle		
. Kit/Parts	$20	
. Labor, Hours	1 HR.	

3.4 Recurring Retrofit Costs

. Fuel Economy, miles/gallon	Baseline	Retrofit
City	15	15
Highway	15	15
Composite	NO CHANGE	
. Parts Replacement Cost		—

4. Marketing Information/Plan ENCLOSURE 2
(BASIC PLAN ACCURATE — SOME NUMBERS
NEED TO BE UPDATED.

RETROFIT INFORMATION OUTLINE

Enclosure 1

1. System Information - see attached
   1.1 Retrofit System Description (use extra pages or attach catalog)
   - Principles of Operation ______
   - Installation Reqm'ts ______
   - Adjustments ______
   - MFG Techniques ______

1.2 Development Status

	Number to Date
Conceptual/Design Stage	
Prototype	
Manufactured	5165
Distributed to Dealer	5015
Installed on Vehicles	5000(?)
Total Accumulated Miles (Estimated, Thousands)	5000 K

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combus-tion	Exhaust				
Hydrocarbon			✓					
Carbon Monoxide			✓					
Oxides of Nitrogen			✓					
Particulates			✓					
Other			✓					

1.4 Automotive Adaptability (Attach catalog if available)
Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	GM	Ford	Foreign (Specify)
Year (Range)	67 - 72	59 - 72	57 - 72	54 - 72	
Engine CID (Range)	290 - 390	273 - 440	283 - 455	221 - 428	
Number of Retrofit Model Types to Satisfy Application	1	4	6	5	

1. System Information

1.1 Retrofit System Description. The VARICAM replaces the stock sprocket on the nose of the crankshaft and provides automatic variable valve timing.

Principles of Operation. The valve train of any standard internal combustion engine is a compromise: being fixed, it has only one RPM range where peak overall efficiency is realized. Above and below this RPM range (at approximately freeway speeds for most passenger cars), the engine overall efficiency falls off. The VARICAM, by advancing the valve timing at low speeds and retarding it at high speeds, affords a higher overall efficiency throughout the engine's operating range. A spring of the highest quality is used to advance the valve timing. As engine speed increases, more and more torque is required to rotate the camshaft. As this torque buildup occurs, the spring is deflected and the valve timing moves toward the retard position in a near linear relation. This variation in valve timing results in increased performance, better specific fuel consumption traits, and reduced exhaust emissions.

Installation Requirements. Remove the front valve chain cover and the stock camshaft sprocket, replace the sprocket with the VARICAM per the furnished instructions and replace the front cover.

Adjustments. Other than minor ignition re-setting on installation, no adjustments should be required for the life of the engine.

Manufacturing Techniques. In most cases, stock sprockets are modified by machining methods, faceplates are machined from bar stock (or die cast if quantities are sufficient to make this method economically feasible), and the units assembled and adjusted at the point of origin.

2. Performance Data

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start ___ 7-Mode Cold-Start ___			Federal Tests 1970 ✓ 1972 ___			Other Tests (specify units and test conditions)			Particulates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ___	CO, ___	NO_x, ___	___
Baseline, as received				12.9	123	3.2				
Baseline, after tune-up										
Retrofit device test				5.5	61	1.7				
Number of cars				1	1	1				
Test source	NAPCA test requested by U.S. Army Tank-Automotive Command									
Additional test data										
Durability Fleet										

Test Data (Attach Data If Available)

2.2 Special Reqm'ts., if any (Fuel,Safety) None

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source
Unlimited	95%	Users

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
✓			

2.5 Periodic Maintenance/ Inspection Requirements None

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make Olds Toronado Year 66 Engine CID 425 Transmission ☐ M ☑ A

Ambient Temperature 62 °F

Car & engine mileage - 73,764
VARICAM mileage - 32,161

Car Preparation Data

Basic Ignition Timing 18 Degrees
Point Dwell 30 Degrees
Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 1 sec															
	No. of attempts 1															
	Choke Hi-cam (N) 20 sec	N/A	✓	☐	☐											
	Kickdown (N) 10 sec	N/A	✓	☐	☐											
	In drive, 10 sec	N/A	✓	☐	☐											
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					✓	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											✓	☐	☐		
	Accel 30-55 (WOT at Detent)					✓	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											✓	☐	☐		
	Accel 15-50 (1/2 Throttle)					✓	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											✓	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	N/A	✓	☐	☐											
	Stop Engine, Soak 15 Min, Restart: Start Time 1 Sec, Attempts 1															
Hot Start Evaluation	Idle, 15 Seconds	N/A	✓	☐	☐											
	Accel 0-30 (1/2 Throttle)					✓	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											✓	☐	☐		
	Accel 30-55 (WOT at Detent)					✓	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											✓	☐	☐		
	Accel 15-50 (1/2 Throttle)					✓	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											✓	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	N/A	✓	☐	☐											

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	8.6	8.4	8.6
Decel 60-30, Sec	21.8	23.3	25.4

Comments Car started immediately. All operation was smooth.

Enclosure 1 cont.

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost

	Cost	Quantity
. Initial Cost	40-50	10,000
. Developmental/Prototype	Existing	
. Manufacturing	12-18	10,000
. Distribution	Normal	

3.2 Profit Margins

. Manufacturer	20% of gross	
. Distributor	30% " "	
. Dealer/Installer (Retail)	50% " "	

3.3 Installation on Vehicle

. Kit/Parts	40-50	10,000
. Labor, Hours	1-2	

3.4 Recurring Retrofit Costs

. Fuel Economy, miles/gallon	Baseline	Retrofit
City	10.12	11.76
Highway	—	—
Composite	—	—
. Parts Replacement Cost		None

4. Marketing Information/Plan Through warehouse distributors and retail outlets (standard channels)

RETROFIT INFORMATION OUTLINE

Enclosure 1

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog) See Encl. #1

. Principles of Operation Speed controlled exhaust gas recirculation & spark retard

. Installation Reqm'ts Mechanic plus normal shop tools

. Adjustments Lean best carburetor idle setting

. MFG Techniques Purchase & assemble components into kits

1.2 Development Status

	Number to Date	
Conceptual/Design Stage	9	
Prototype	90 by	Apr. 10, 1972
Manufactured	None	
Distributed to Dealer	"	
Installed on Vehicles	9	
Total Accumulated Miles (Estimated, Thousands)	52,000	

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combus-tion	Exhaust				
Hydrocarbon	X	X	X					
Carbon Monoxide	X	X	X					
Oxides of Nitrogen	X	X	X					
Particulates								
Other								

1.4 Automotive Adaptability (Attach catalog if available) See Encl. #2

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	CM	Ford	Foreign (Specify)
Year (Range)	'55-'71	'55-'71	'55-'71	[illegible]-'71	V[illegible] Sedan
Engine CID (Range)	All	All	All	[illegible]	1[illegible]00-1500 C.C.
Number of Retrofit Model Types to Satisfy Application	10	12	65		1

2. Performance Data

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test. Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start ____ 7-Mode Cold-Start ____			Federal Tests 1970 ____ 1972 X			Other Tests (specify units and test conditions)			Particulates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, GPM	CO, GPM	NO_x, GPM	____
Baseline, as received										
Baseline, after tune-up				5.09	12.51	9.85	8.3	113.8	1.4	—
Retrofit device test				3.30	11.37	3.06	16.66	59.73	0.485	—
Number of cars				1	1	1				
Test source				Scott Research Labs.			E.P.A. - Ypsilanti, Michigan			
Additional test data							'72 Cold Starts			
Durability Fleet				'69 Ford Wagon			'63 Chevrolet Sedan			

Test Data (Attach Data If Available) See Enclosure #3 for additional data

2.2 Special Reqm'ts., if any (Fuel,Safety) None other than normal precautions observed by mechanics concerning hot engine parts.

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source
Insufficient data available		

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
Insufficient data available			Component replacement

2.5 Periodic Maintenance/ Inspection Requirements Functional inspection at installation. Clean orifice in valve each 6 months.

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make Plymouth Year 1964 Engine CID 318 Transmission ☐ M ☒ A

Ambient Temperature 59 °F

Car Preparation Data

Basic Ignition Timing ____ Degrees

Point Dwell _____ Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel.	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 5 sec															
	No. of attempts 2															
	Choke Hi-cam (N) 20 sec	700	X													
	Kickdown (N) 10 sec	550	X													
	In drive, 10 sec	500	X													
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)															
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)					X										
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)															
	Idle, 15 Seconds	550	X													

Stop Engine, Soak 15 Min, Restart: Start Time 1 Sec, Attempts 1

		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	550	X													
	Accel 0-30 (1/2 Throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)															
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)					X										
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)															
	Idle, 15 Seconds	550	X													

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	13	12	12
Decel 60-30, Sec	18	25	23

Comments ____________

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost	Cost	Quantity
. Initial Cost	$62,600	9
. Developmental/Prototype	30,000	90
. Manufacturing	25.00	Each - based on high volume mfg. product
. Distribution	60.00	" " " " " " "

3.2 Profit Margins		
. Manufacturer	25%	Gross
. Distributor	35%	"
. Dealer/Installer (Retail)	40%	"

3.3 Installation on Vehicle		
. Kit/Parts	$85.00	1
. Labor, Hours	20.00	2

3.4 Recurring Retrofit Costs

. Fuel Economy , miles/gallon	Baseline	Retrofit	
City	9.18 *14.71	8.20 *13.47	1st Figure - '69 Ford Wagon 2nd Figure (*) - '64 Plymouth Sedan
Highway	15.56 *18.12	15.00 *19.60	
Composite	15.89 *17.78	14.20 *19.00	See Encl. #4
. Parts Replacement Cost		** $17.50	

** Maximum single component replacement cost.

4. Marketing Information/Plan Tentative plans to market through present parts distribution channels; independent Wholesale Parts jobbers, NAPA Warehouse distributors, O.E. vehicle manufacturers service parts franchised dealer distribution channels. Training provided through present field representatives (approx. 175) by "in location" clinics and also by training facilities, and manpower of the O.E. vehicle manufacturers.

RETROFIT INFORMATION OUTLINE

Enclosure 1

1. **System Information**

1.1 Retrofit System Description (use extra pages or attach catalog)

- . Principles of Operation Photocell controlled ignition system
- . Installation Reqm'ts modified distributor
- . Adjustments One initial
- . MFG Techniques some machining & PC boards

1.2 Development Status

	Number to Date
Conceptual/Design Stage	
Prototype	15
Manufactured	0
Distributed to Dealer	0
Installed on Vehicles	10
Total Accumulated Miles (Estimated, Thousands)	300

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combus-tion	Exhaust				
Hydrocarbon		✓						
Carbon Monoxide								
Oxides of Nitrogen								
Particulates								
Other								

A substantiating test of unburned exhaust gases is required - Please refer to the attached test report

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	GM	Ford	Foreign (Specify)
Year (Range)					
Engine CID (Range)					
Number of Retrofit					

Model Types to Satisfy Application All gasoline driven engines, utilizing a distributor

2. Performance Data

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start ____ 7-Mode Cold-Start ____			Federal Tests 1970 ____ 1972 ____			Other Tests (specify units and test conditions)			Particu-lates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ___	CO, ___	NO_x, ___	____
Baseline, as received										
Baseline, after tune-up										
Retrofit device test										
Number of cars										
Test source										
Additional test data										
Durability Fleet										

Test Data (Attach Data If Available)

2.2 Special Reqm'ts., if any (Fuel, Safety)______________________________

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair

2.5 Periodic Maintenance/ Inspection Requirements No maintenance req'd, except spark plug change approx. every 25000 miles

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make __________ Year______ Engine CID_______Transmission ☐ M ☐ A

Ambient Temperature _____°F

Car Preparation Data

Basic Ignition Timing ____Degrees

Point Dwell _____Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel.	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time_____sec															
	No. of attempts_______															
	Choke Hi-cam (N) 20 sec		☐	☐	☐											
	Kickdown (N) 10 sec		☐	☐	☐											
	In drive, 10 sec		☐	☐	☐											
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☐	☐	☐		
	Accel 30-55 (WOT at Detent)					☐	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☐	☐	☐		
	Accel 15-50 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☐	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds		☐	☐	☐											

Stop Engine, Soak 15 Min, Restart: Start Time_____Sec, Attempts _______

		Idle Mode				Accel. Mode						Cruise			Decel.	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds		☐	☐	☐											
	Accel 0-30 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☐	☐	☐		
	Accel 30-55 (WOT at Detent)					☐	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☐	☐	☐		
	Accel 15-50 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☐	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds		☐	☐	☐											

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec			
Decel 60-30, Sec			

Comments ____________________

____

____

____

Enclosure 1 cont.

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost	Cost	Quantity	
. Initial Cost			
. Developmental/Prototype			
. Manufacturing	$ 50.–	100,000	approx
. Distribution			

3.2 Profit Margins		
. Manufacturer		
. Distributor		
. Dealer/Installer (Retail)		

3.3 Installation on Vehicle		
. Kit/Parts		
. Labor, Hours		

3.4 Recurring Retrofit Costs

. Fuel Economy, miles/gallon	Baseline	Retrofit
City		
Highway		
Composite		
. Parts Replacement Cost		

4. Marketing Information/Plan ____________________________________

RETROFIT INFORMATION OUTLINE

1. System Information

MARK TEN "B"

1.1 Retrofit System Description (use extra pages or attach catalog)

- Principles of Operation Fast Rise - High energy ignition - (Capacitive Discharge).
- Installation Reqm'ts Connect 4 wires - Install 3 screws.
- Adjustments Increase plug gap for maximum effectiveness.
- MFG Techniques Printed circuit board assembly.

1.2 Development Status

	Number to Date	
Conceptual/Design Stage		
Prototype		
Manufactured	200,000 +	
Distributed to Dealer		
Installed on Vehicles	200,000	
Total Accumulated Miles (Estimated, Thousands)	10,000,000	Thousands

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combus-tion	Exhaust				
Hydrocarbon		X						
Carbon Monoxide								
Oxides of Nitrogen		X						
Particulates								
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	CM	Ford	Foreign (Specify)
Year (Range)		Applicable to all vehicles			
Engine CID (Range)	which are 12 V. negative ground powered.				
Number of Retrofit Model Types to Satisfy Application					

2. Performance Data

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start _____ 7-Mode Cold-Start _____			Federal Tests 1970 _____ 1972 _____			Other Tests (specify units and test conditions)			Particulates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ___	CO, ___	NO_x, ___	_____
Baseline, as received										
Baseline, after tune-up										
Retrofit device test										
Number of cars										
Test source										
Additional test data										
Durability Fleet										

Test Data (Attach Data If Available)

2.2 Special Reqm'ts., if any (Fuel,Safety) None

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source
250,000 Min.	90% +	Field Data

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
0.5			Std. - Most available at Electronic Supply Outlet

2.5 Periodic Maintenance/ Inspection Requirements None

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make __________ Year______ Engine CID_______Transmission ☐ M ☐ A

Ambient Temperature _____ °F

Car Preparation Data

Basic Ignition Timing ____Degrees

Point Dwell _____Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time_____sec															
	No. of attempts_______															
	Choke Hi-cam (N) 20 sec	☐	☐	☐	☐											
	Kickdown (N) 10 sec	☐	☐	☐	☐											
	In drive, 10 sec	☐	☐	☐	☐											
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☐	☐	☐		
	Accel 30-55 (WOT at Detent)					☐	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☐	☐	☐		
	Accel 15-50 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☐	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	☐	☐	☐	☐											

Stop Engine, Soak 15 Min, Restart: Start Time______Sec, Attempts ______

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	☐	☐	☐	☐											
	Accel 0-30 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☐	☐	☐		
	Accel 30-55 (WOT at Detent)					☐	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☐	☐	☐		
	Accel 15-50 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☐	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	☐	☐	☐	☐											

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec			
Decel 60-30, Sec			

Comments ______________________

____

____

____

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost

	Cost	Quantity
. Initial Cost	None	
. Developmental/Prototype	None	
. Manufacturing	$20.00 each	25,000 Min.
. Distribution		

3.2 Profit Margins

. Manufacturer		
. Distributor		
. Dealer/Installer (Retail)		

3.3 Installation on Vehicle

. Kit/Parts		
. Labor, Hours	0.5	

3.4 Recurring Retrofit Costs

. Fuel Economy , miles/gallon	Baseline	Retrofit
City		
Highway		
Composite		
. Parts Replacement Cost		

4. Marketing Information/Plan Presently marketed through Dealers.

Retail cost - $59.95

Enclosure 1

RETROFIT INFORMATION OUTLINE

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

. Principles of Operation Retard spark at low RPM.

. Installation Reqm'ts Use with Mark Ten, connect 4 wires.

. Adjustments Readjust timing at distributor.

. MFG Techniques Standard printed circuit board assembly.

1.2 Development Status

	Number to Date
Conceptual/Design Stage	3
Prototype	12
Manufactured	12
Distributed to Dealer	None
Installed on Vehicles	3
Total Accumulated Miles (Estimated, Thousands)	25

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combus-tion	Exhaust				
Hydrocarbon		X						
Carbon Monoxide								
Oxides of Nitrogen		X						
Particulates								
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	CM	Ford	Foreign (Specify)
Year (Range)	All applicable with variable effectiveness.				
Engine CID (Range)					
Number of Retrofit Model Types to Satisfy Application					

2. Performance Data

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test. Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start ______ 7-Mode Cold-Start ______			Federal Tests 1970 ______ 1972 ______			Other Tests (specify units and test conditions)			Particulates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ____	CO, ____	NO_x, ____	______
Baseline, as received										
Baseline, after tune-up		Insufficient data available at this time.								
Retrofit device test										
Number of cars										
Test source										
Additional test data										
Durability Fleet										

Test Data (Attach Data If Available)

2.2 Special Reqm'ts., if any (Fuel,Safety) None

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source
10^6		Estimate

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
1.0		Estimate	Std. - Available at Electronic Supply Store.

2.5 Periodic Maintenance/ Inspection Requirements No maintenance required, periodic check with timing device desirable to assure effectiveness (annually).

2.6 Drivability Evaluation-Retrofit Device not Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make Dodge Year 72 Engine CID 440 Transmission ☐ M ☒ A

Ambient Temperature 22 °F

Car Preparation Data

Basic Ignition Timing 12 Degrees

Point Dwell 32 Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time ____ sec															
	No. of attempts 2															
	Choke Hi-cam (N) 20 sec	800														
	Kickdown (N) 10 sec	800	X													
	In drive, 10 sec	700														
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)															
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)					X										
	Cruise 50 (0.1 Mile)															
	Decel 50-0 (Mod Brake)															
	Idle, 15 Seconds	600	X													

Stop Engine, Soak 15 Min, Restart: Start Time 10 Sec, Attempts 1

		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	700	X													
	Accel 0-30 (1/2 Throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)														X	
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)					X										
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)														X	
	Idle, 15 Seconds	600	X													

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	32	24	13.5
Decel 60-30, Sec	24	24.5	24.5

Comments

Reproduced from best available copy.

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make *Dodge* Year *1972* Engine CID *440* Transmission M ☐ A ☒

Ambient Temperature *10* °F

Car Preparation Data

Basic Ignition Timing *12* Degrees

Point Dwell *32* Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time *5* sec															
	No. of attempts *2*															
	Choke Hi-cam (N) 20 sec	*1000*	☐	☐	☐											
	Kickdown (N) 10 sec	*750*	☐	☐	☐											
	In drive, 10 sec	*600*	☐	☐	☐											
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☒	☐	☐		
	Accel 30-55 (WOT at Detent)					☒	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☒	☐	☐		
	Accel 15-50 (1/2 Throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☒	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	*600*	☒	☐	☐											

Stop Engine, Soak 15 Min, Restart: Start Time *2* Sec, Attempts *1*

		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	*700*	☐	☐	☐											
	Accel 0-30 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☐	☐	☐		
	Accel 30-55 (WOT at Detent)					☐	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☐	☐	☐		
	Accel 15-50 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☐	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	*650*	☐	☐	☐											

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	*10 1/2*	*10*	*10 1/2*
Decel 60-30, Sec	*24*	*23*	*27*

Comments *Altitude 4700'*
2° additional advance
for altitude compensation
sea level carburetor
jets

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost

	Cost	Quantity	
. Initial Cost	Major Developement		
. Developmental/Prototype	Complete (	See Below)	
. Manufacturing	$15.00 Each	25,000 Min.	Includes Profit
. Distribution			

3.2 Profit Margins

. Manufacturer	See Above	
. Distributor	Not Known	
. Dealer/Installer (Retail)		

3.3 Installation on Vehicle

. Kit/Parts	Not Known	(See Above)
. Labor, Hours	1.0 Max.	

3.4 Recurring Retrofit Costs

	Baseline	Retrofit
. Fuel Economy , miles/gallon		
City		
Highway	No Data	
Composite		
. Parts Replacement Cost		

4. Marketing Information/Plan No plan for marketing.

Note: This add-on could be incorporated in the Mark Ten "B" ("System #1" as submitted) and could be marketed for under $60.00 complete in reasonable numbers.

Enclosure 1

RETROFIT INFORMATION OUTLINE

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

. Principles of Operation SEE BROCHURE ENCLOSURE #1

. Installation Reqm'ts " " " " PARA

. Adjustments " " " " "

. MFG Techniques SEE PATENT ENCLOSURE #2 & 3

1.2 Development Status

	Number to Date
Conceptual/Design Stage	—
Prototype	—
Manufactured	2000 ±
Distributed to Dealer	NONE
Installed on Vehicles	2000 ±
Total Accumulated Miles (Estimated, Thousands)	N.A.

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combus-tion	Exhaust				
Hydrocarbon	DOES NOT APPLY						SEE ENC. #1	
Carbon Monoxide							PAR. B &	
Oxides of Nitrogen								
Particulates							ENCL #4	
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	GM	Ford	Foreign (Specify)
Year (Range)	ALL	ALL	ALL	ALL	ALL
Engine CID (Range)	ALL	ALL	ALL	ALL	ALL
Number of Retrofit	1	1	1	1	1

Model Types to Satisfy Application AUTOMOBILE UNIT FITS ALL CARS
TRUCK UNIT FITS ALL TRUCKS
GASOLINE, DIESEL (#2 FUEL) & INDUSTRIAL (#6 FUEL)

2. Performance Data

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start ____ 7-Mode Cold-Start ____			Federal Tests 1970 ____ 1972 ____			Other Tests (specify units and test conditions)			Particu-lates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ____	CO, ____	NO_x, ____	____
Baseline, as received										
Baseline, after tune-up										
Retrofit device test										
Number of cars										
Test source	SEE ENCLOSURES #4 & 5									
Additional test data										
Durability Fleet										

Test Data (Attach Data If Available)

2.2 Special Reqm'ts., if any (Fuel,Safety) NONE

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source
NONE	—	—

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
NONE	—	—	NONE

2.5 Periodic Maintenance/ Inspection Requirements NONE

SEE ENCLOSURES #4,5&6

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make ____________ Year_______ Engine CID________ Transmission ☐ M ☐ A

Ambient Temperature ______ °F

Car Preparation Data

Basic Ignition Timing ____ Degrees

Point Dwell _____ Degrees

Other Special Adjustments: Attach Data Sheet NONE

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time _____ sec															
	No. of attempts _______															
	Choke Hi-cam (N) 20 sec	☐	☐	☐	☐											
	Kickdown (N) 10 sec	☐	☐	☐	☐											
	In drive, 10 sec	☐	☐	☐	☐											
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☐	☐	☐		
	Accel 30-55 (WOT at Detent)					☐	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☐	☐	☐		
	Accel 15-50 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☐	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	☐	☐	☐	☐											

Stop Engine, Soak 15 Min, Restart: Start Time_______Sec, Attempts _______

		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	☐	☐	☐	☐											
	Accel 0-30 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☐	☐	☐		
	Accel 30-55 (WOT at Detent)					☐	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☐	☐	☐		
	Accel 15-50 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☐	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	☐	☐	☐	☐											

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec			
Decel 60-30, Sec			

Comments ________________________

ESTIMATED FOR CARS (C) TRUCKS (T)

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost	Cost	Quantity
. Initial Cost	75.C 200.T	
. Developmental/Prototype	—	—
. Manufacturing	N.A.	N.A.
. Distribution	N.A.	N.A.
3.2 Profit Margins		
. Manufacturer	N.A.	N.A.
. Distributor	N.A	N.A.
. Dealer/Installer (Retail)	N.A.	N.A.
3.3 Installation on Vehicle		
. Kit/Parts	$5.00	ANY
. Labor, Hours	.5 HRS	ANY

3.4 Recurring Retrofit Costs		
. Fuel Economy, miles/gallon	Baseline	Retrofit
City	SEE ENCL.	#1 PAR C
Highway	"	"
Composite	"	"
. Parts Replacement Cost		NONE

4. Marketing Information/Plan SEE ENCLOSED LETTER

RETROFIT INFORMATION OUTLINE

Enclosure 1

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

- Principles of Operation Use of propane gas (LP-gas) as motor fuel.
- Installation Reqm'ts Can be installed with or without modification of motor
- Adjustments such as increasing compression, changing timing, etc.
- MFG Techniques Zinc & aluminum die castings, machined, stamped, etc.

1.2 Development Status

	For the #40 Carburetor: Number to Date	Note: The #725 Regulator and other components have been on the market for years.
Conceptual/Design Stage	xx	xx
Prototype	xx	xx
Manufactured	400	6000
Distributed to Dealer	300	5,600
Installed on Vehicles	12 on motor vehicles 240 on stationary engines	5,300
Total Accumulated Miles (Estimated, Thousands)	20,000 miles	millions of miles

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combus-tion	Exhaust				
Hydrocarbon								
Carbon Monoxide								
Oxides of Nitrogen								
Particulates								
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	CM	Ford	Foreign (Specify)
Year (Range)					
Engine CID (Range)	250-430*	250-430*	250-430*	25-430*	?
Number of Retrofit Model Types to Satisfy Application					

*We have no detailed application catalog worked out yet on the #40 Carburetor. We can fit most all pickups having motors from 250 to 430 C.I.D. On cars, however, we don't have the 7½ to 8" needed on some models between manifold flange and car hood.

2. Performance Data

2.1 Exhaust Emission Performance (Avg Value if More than One Test. Please Attach Supporting Data).

For the #40LP Gas Carburetor & 725 Regulator on 1965 Ford V8 car, 289c.i.d.

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start ____ 7-Mode Cold-Start ____			Federal Tests 1970 ____ 1972 ____			Other Tests (specify units and test conditions)			Particulates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ppm	CO, %	NO_x, ____	____
Baseline, as received										
Baseline, after tune-up								4.5	?	
Retrofit device test							500 to 780	0.15	no data	no data
Number of cars							1	1	no data	no data
Test source										
Additional test data										
Durability Fleet Test Data (Attach Data If Available)										

2.2 Special Reqm'ts., if any (Fuel,Safety) ____________________

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair

2.5 Periodic Maintenance/ Inspection Requirements Very trouble-free. Little or no maintenance required, unless LP-gas is unusually dirty, in which case the regulator might need cleaning. Say once a year.

Enclosure 1 Cont.

For the #40LP carburetor, #725 Regulator & #8 Accessory Kit with motor fuel tank.

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make __________ Year ______ Engine CID _______ Transmission ☐ ☐ M A

Ambient Temperature ______ °F

Car Preparation Data

Basic Ignition Timing ____ Degrees

Point Dwell _____ Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time _____ sec															
	No. of attempts _______															
	Choke Hi-cam (N) 20 sec	☐	☐	☐	☐											
	Kickdown (N) 10 sec	☐	☐	☐	☐											
	In drive, 10 sec	☐	☐	☐	☐											
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☐	☐	☐		
	Accel 30-55 (WOT at Detent)					☐	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☐	☐	☐		
	Accel 15-50 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☐	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	☐	☐	☐	☐											

Stop Engine, Soak 15 Min, Restart: Start Time _____ Sec, Attempts _______

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	☐	☐	☐	☐											
	Accel 0-30 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☐	☐	☐		
	Accel 30-55 (WOT at Detent)					☐	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☐	☐	☐		
	Accel 15-50 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☐	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	☐	☐	☐	☐											

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec			
Decel 60-30, Sec			

Comments We have had no testing done according to official procedures.

For the #40LP carburetor, #725 Regulator
& #8 Accessory Kit with motor fuel tank.

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost

	UserCost	Quantity
. Initial Cost	$330.00	each set
. Developmental/Prototype		
. Manufacturing		
. Distribution		

3.2 Profit Margins

. Manufacturer		
. Distributor		
. Dealer/Installer (Retail)		

We have
no answers
here.

3.3 Installation on Vehicle Fuel tank $125.00

. Kit/Parts	165.00	
. Labor, Hours 5 hrs.$8.00/hour	$40.00	

3.4 Recurring Retrofit Costs nil

. Fuel Economy , miles/gallon	Baseline	Retrofit
City		
Highway On many US autos,	10 to 12	10 to 11
Composite		
. Parts Replacement Cost		$30 to $40

Note: LP-gas in many areas is 10 to 25% cheaper per gallon than gasoline. This can mean that fuel costs will be the same in some cases, 10 to 20% less in other cases.

4. Marketing Information/Plan We now sell largely to the lift truck dealers and manufacturers, and LP-gas dealers. For an ambitious clean-air carburetion sales program we probably should market thru auto garages.

Enclosure 1

RETROFIT INFORMATION OUTLINE

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

- Principles of Operation: see extra paper
- Installation Reqm'ts: about ½ hour work
- Adjustments: idle for old cars
- MFG Techniques: screw machining

1.2 Development Status

	Number to Date
Conceptual/Design Stage	90% for all cars
Prototype	50
Manufactured	
Distributed to Dealer	
Installed on Vehicles	15
Total Accumulated Miles (Estimated, Thousands)	70.000

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combustion	Exhaust				
Hydrocarbon	✓					yes		
Carbon Monoxide	✓					yes		
Oxides of Nitrogen	✓					yes	} MIS INTKET?	
Particulates								
Other						yes *		

1.4 Automotive Adaptability (Attach catalog if available) **

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	CM	Ford	Foreign (Specify)
Year (Range)					
Engine CID (Range)					
Number of Retrofit Model Types to Satisfy Application					

* see attached data

** see attached data

Enclosure 1 cont.

2. Performance Data

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start ____ 7-Mode Cold-Start ____			Federal Tests 1970 ____ 1972 ____			Other Tests (specify units and test conditions)			Particu-lates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ___	CO, ___	NO_x, ___	___
Baseline, as received										
Baseline, after tune-up										
Retrofit device test										
Number of cars										
Test source										
Additional test data										
Durability Fleet										

Test Data (Attach Data If Available) *

2.2 Special Reqm'ts., if any (Fuel,Safety) none

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source
	100%	

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
no maintenance is necessary			

2.5 Periodic Maintenance/ Inspection Requirements none

* see attached data

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make __________ Year______ Engine CID_______ Transmission ☐ M ☐ A

Ambient Temperature ______°F

Car Preparation Data

Basic Ignition Timing ____Degrees

Point Dwell _____Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time_____sec															
	No. of attempts_______															
	Choke Hi-cam (N) 20 sec	☐	+	☐	☐											
	Kickdown (N) 10 sec	☐	+	☐	☐											
	In drive, 10 sec	☐	+	☐	☐											
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					+	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											+	☐	☐		
	Accel 30-55 (WOT at Detent)					+	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											+	☐	☐		
	Accel 15-50 (1/2 Throttle)					+	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											+	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	☐	+	☐	☐											

Stop Engine, Soak 15 Min, Restart: Start Time______Sec, Attempts _______

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	☐	+	☐	☐											
	Accel 0-30 (1/2 Throttle)					+	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											+	☐	☐		
	Accel 30-55 (WOT at Detent)					+	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											+	☐	☐		
	Accel 15-50 (1/2 Throttle)					+	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											+	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	☐	+	☐	☐											

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec			
Decel 60-30, Sec			

Comments ______________________

____

____

____

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost	Cost	Quantity	
. Initial Cost	$ 18 to $ 25	1	
. Developmental/Prototype			
. Manufacturing	appr. 7500	1000	$7.50 each.
. Distribution			

3.2 Profit Margins		
. Manufacturer	normal	
. Distributor	normal	
. Dealer/Installer (Retail)	normal	

3.3 Installation on Vehicle		
. Kit/Parts		
. Labor, Hours	½ hour	1

3.4 Recurring Retrofit Costs			
. Fuel Economy , miles/gallon	Baseline	Retrofit	
City		15% - 20%	measured reduction
Highway			
Composite			
. Parts Replacement Cost		none	

4. Marketing Information/Plan ______________________

RETROFIT INFORMATION OUTLINE

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

- Principles of Operation Fuel metering calibrated relative to air mass flow
- Installation Reqm'ts Fits Ford & G.M. V-8 engines. Simple adaptors required for some others--throttle linkage adaptors generally required.
- Adjustments ~~Throttle linkage and auto trans. Dashpot.~~
- MFG Techniques Aluminum die casting and production machined parts.

1.2 Development Status

	Number to Date
Conceptual/Design Stage	5 Models
Prototypes	15
Manufactured	0
Distributed to Dealer	0
Installed on Vehicles	5
Total Accumulated Miles ~~(Estimated, Thousands)~~	10,000

(High performance model ready for mass production October '71)

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combus-tion	Exhaust				
Hydrocarbon	X							
Carbon Monoxide	X							
Oxides of Nitrogen	X							
Particulates								
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	GM	Ford	Foreign (Specify)
Year (Range)	All	All	All	All	All
Engine CID (Range)*	All	All	All	All	All
Number of Retrofit Model Types to Satisfy Application**	4	4	4	4	4

*Existing prototypes for 100-200 C.I.D. and 300-500 C.I.D.

**Linkage kits in greater numbers.

2. Performance Data

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

More detailed data will be available in a few weeks.

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start X 7-Mode Cold-Start ____			3000 Inertia Weight Federal Tests 1970 ____ 1972 ____			Other Tests (specify units and test conditions)			Particulates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ____	CO, ____	NO_x, ____	____
Baseline, as received										
Baseline, after tune-up*				1.84	9.3	(0.87)Estimated				
Retrofit device test**				1.28	8.5	2.07				
Number of cars				1	1	1				
Test source	Scott Research Labs, Wilmington, California Facility (Report Attached)									
Additional test data										
Durability Fleet										

Test Data (Attach Data If Available)
*Included Exhaust Recycle System
**Without Exhaust Recycle System

2.2 Special Reqm'ts., if any (Fuel, Safety) None

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source

Engineering judgement indicates that the VVC will be much better than other existing carburetors.

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair

No maintenance with perhaps exception of a simple spring adjustment done twice during lifetime of the vehicle.

2.5 Periodic Maintenance/ Inspection Requirements (Same as 2.4)

(These data will be available to this detail in about two weeks.)

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make ___________ Year_______ Engine CID_______ Transmission ☐ M ☐ A

Ambient Temperature ______ °F

Car Preparation Data

Basic Ignition Timing ____Degrees

Point Dwell _____Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time_____sec															
	No. of attempts_______															
	Choke Hi-cam (N) 20 sec	☐	☐	☐	☐											
	Kickdown (N) 10 sec	☐	☐	☐	☐											
	In drive, 10 sec	☐	☐	☐	☐											
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☐	☐	☐		
	Accel 30-55 (WOT at Detent)					☐	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☐	☐	☐		
	Accel 15-50 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☐	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	☐	☐	☐	☐											

Stop Engine, Soak 15 Min, Restart: Start Time______Sec, Attempts _______

		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	☐	☐	☐	☐											
	Accel 0-30 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☐	☐	☐		
	Accel 30-55 (WOT at Detent)					☐	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☐	☐	☐		
	Accel 15-50 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☐	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	☐	☐	☐	☐											

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec			
Decel 60-30, Sec			

Comments ____________________

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost

	Cost	Quantity
. Initial Cost		
. Developmental/Prototype		
. Manufacturing		
. Distribution		

This data not ready for presentation at this time, however, detailed data is becoming available on low production runs of a high performance version of the carburetor

3.2 Profit Margins

. Manufacturer		
. Distributor		
. Dealer/Installer (Retail)		

3.3 Installation on Vehicle

. Kit/Parts		
. Labor, Hours		1/2 hour

3.4 Recurring Retrofit Costs

. Fuel Economy, miles/gallon	Baseline	Retrofit
City		
Highway		
Composite		
. Parts Replacement Cost		

4. Marketing Information/Plan Plan to license for manufacturing and marketing with a major vendor. Will manufacture and market the High Performance configuration.

Enclosure 1

RETROFIT INFORMATION OUTLINE

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

- Principles of Operation: Electronically control ignition timing & increase spark intensity.
- Installation Reqm'ts: Attaches to ignition coil & points
- Adjustments: Normal engine manufacturer specification
- MFG Techniques: Printed circuit board with state of the art silicon I C chips, switching power transistors.

1.2 Development Status

	Number to Date
Conceptual/Design Stage	
Prototype	
Manufactured	100
Distributed to Dealer	
Installed on Vehicles	20
Total Accumulated Miles (Estimated, Thousands)	30,000

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control		
	Induction	Ignition	Combus-tion	Exhaust			Exhaust	Crank-case
Hydrocarbon		x						
Carbon Monoxide		x						
Oxides of Nitrogen								
Particulates								
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	CM	Ford	Foreign (Specify)
Year (Range)	ALL	ALL	ALL	ALL	*ALL Neg Ground
Engine CID (Range)	"	"	"	"	"
Number of Retrofit Model Types to Satisfy Application	"	"	"	"	"

* Positive Ground Systems available on request.

** Wankle Eng. Systems available on request.

2. Performance Data

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test. Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start ____ 7-Mode Cold-Start ____			Federal Tests 1970 ____ 1972 ____			Other Tests (specify units and test conditions)			Particulates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ____	CO, ____	NO_x, ____	____
Baseline, as received										
Baseline, after tune-up										
Retrofit device test										
Number of cars										
Test source										
Additional test data										
Durability Fleet										

Test Data (Attach Data If Available) See Attached CARB Test Results

2.2 Special Reqm'ts., if any (Fuel,Safety) None, this device allows the use of all grade gasoline fuels, such as Ethyl non-leaded, low lead, etc. without detriment to performance or side effects to engine such as knocking or pinging.

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source
	10,000	

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
10 min.			warranty provides full replacement

2.5 Periodic Maintenance/Inspection Requirements Every 50,000 miles

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make 1965 Year CAD Engine CID 429 Transmission ☐ M ☒ A

Ambient Temperature ______ °F

Car Preparation Data

Normal Mfg. Spec.
Basic Ignition Timing 5 Degrees
Point Dwell ____ Degrees
Other Special Adjustments: Attach Data Sheet None

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 2 sec															
	No. of attempts 1															
	Choke Hi-cam (N) 20 sec		X													
	Kickdown (N) 10 sec		X													
	In drive, 10 sec		X													
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					x										
	Cruise 30 (0.1 Mile)											x				
	Accel 30-55 (WOT at Detent)					x										
	Decel 55-15 (Mod Brake)														x	
	Cruise 15 (0.1 Mile)											x				
	Accel 15-50 (1/2 Throttle)					x										
	Cruise 50 (0.1 Mile)											x				
	Decel 50-0 (Mod Brake)														x	
	Idle, 15 Seconds		x													

Stop Engine, Soak 15 Min, Restart: Start Time 2 Sec, Attempts 1

		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds		x													
	Accel 0-30 (1/2 Throttle)					x										
	Cruise 30 (0.1 Mile)											x				
	Accel 30-55 (WOT at Detent)					x										
	Decel 55-15 (Mod Brake)														x	
	Cruise 15 (0.1 Mile)											x				
	Accel 15-50 (1/2 Throttle)					x										
	Cruise 50 (0.1 Mile)											x				
	Decel 50-0 (Mod Brake)														x	
	Idle, 15 Seconds		x													

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec			
Decel 60-30, Sec			

Comments No apparent troubles and a noticeable increase in performance

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost	Cost	Quantity
. Initial Cost	100,000	10,000
. Developmental/Prototype	123,000	
. Manufacturing		
. Distribution	30,000	

3.2 Profit Margins		
. Manufacturer	70,000	10,000
. Distributor	100,000	10,000
. Dealer/Installer (Retail)	200,000	10,000

3.3 Installation on Vehicle		
. Kit/Parts	None	4 connections
. Labor, Hours	3.00	10 min

3.4 Recurring Retrofit Costs		
. Fuel Economy, miles/gallon	Baseline	Retrofit
City	9	10.5
Highway	10	12.0
Composite	9.5	11.75
. Parts Replacement Cost		None

4. Marketing Information/Plan See Enclosure.

In addition, it intended that future distribution will be supplemented through a series of company organized franchised tune-up shops.

RETROFIT INFORMATION OUTLINE

Enclosure 1

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

- Principles of Operation ______
- Installation Reqm'ts INstall IN Exaust Line Close To Motor
- Adjustments NoNe
- MFG Techniques ______

1.2 Development Status

	Number to Date
Conceptual/Design Stage	
Prototype	
Manufactured	
Distributed to Dealer	
Installed on Vehicles	
Total Accumulated Miles (Estimated, Thousands)	86 000 Miles

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combus-tion	Exhaust				
Hydrocarbon	NoNe	NoNe	NoNe	NoNe		NoNe	NoNe	NoNe
Carbon Monoxide				✓				
Oxides of Nitrogen								
Particulates								
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	CM	Ford	Foreign (Specify)
Year (Range)					
Engine CID (Range)					
Number of Retrofit Model Types to Satisfy Application					

2. Performance Data

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test. Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start ____ 7-Mode Cold-Start ____			Federal Tests 1970 ____ 1972 ____			Other Tests (specify units and test conditions)			Particulates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ____	CO, ____	NO_x, ____	____
Baseline, as received										
Baseline, after tune-up										
Retrofit device test										
Number of cars										
Test source										
Additional test data										
Durability Fleet										

Test Data (Attach Data If Available) strictly AN Electical AFter burner, Does Not EFFect Motor whatever

2.2 Special Reqm'ts., if any (Fuel, Safety) ____________________

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
			spark plug

2.5 Periodic Maintenance/ Inspection Requirements Regular Maintenance ON car

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make Chev Year 1967 Engine CID 327 Transmission ☐ M ☒ A

Ambient Temperature _____ °F

Car Preparation Data

Basic Ignition Timing MFg spec Degrees

Point Dwell MFg spec Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time_____sec															
	No. of attempts_______															
	Choke Hi-cam (N) 20 sec	550	☒	☐	☐	X						X				
	Kickdown (N) 10 sec	☐	☐	☐	☐											
	In drive, 10 sec	☐	☐	☐	☐											
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☐	☐	☐		
	Accel 30-55 (WOT at Detent)					☐	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☐	☐	☐		
	Accel 15-50 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☐	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	☐	☐	☐	☐											

Stop Engine, Soak 15 Min, Restart: Start Time_____Sec, Attempts _______

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	☐	☐	☐	☐											
	Accel 0-30 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☐	☐	☐		
	Accel 30-55 (WOT at Detent)					☐	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☐	☐	☐		
	Accel 15-50 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☐	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	☐	☐	☐	☐											

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec			
Decel 60-30, Sec			

Comments ______________________

____

____

____

Without Device

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make Chev. Year 1967 Engine CID 5 154697L142404 Transmission M ☐ A ☒

Ambient Temperature ______ °F

Car Preparation Data

Basic Ignition Timing 2½ Degrees

Point Dwell 30 Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 20 sec															
	No. of attempts 1															
	Choke Hi-cam (N) 20 sec	700	☒	☐	☐											
	Kickdown (N) 10 sec	600	☒	☐	☐											
	In drive, 10 sec	550	☒	☐	☐											
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☒	☐	☐		
	Accel 30-55 (WOT at Detent)					☒	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☒	☐	☐		
	Accel 15-50 (1/2 Throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☒	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	600	☒	☐	☐											

Stop Engine, Soak 15 Min, Restart: Start Time 20 Sec, Attempts 1

		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	600	☐	☐	☐											
	Accel 0-30 (1/2 Throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☒	☐	☐		
	Accel 30-55 (WOT at Detent)					☒	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☒	☐	☐		
	Accel 15-50 (1/2 Throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☒	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	600	☒	☐	☐											

Comments ________________

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-50, Sec	Good	Good	Good
Decel 60-30, Sec	Good	Good	Good

With Device

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make Chev Year 1967 Engine CID 5 1546972142404 Transmission ☐ M ☒ A

Ambient Temperature _____ °F

Car Preparation Data

Basic Ignition Timing 2% Degrees

Point Dwell 30 Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 20 sec															
	No. of attempts 1															
	Choke Hi-cam (N) 20 sec	700	☒	☐	☐											
	Kickdown (N) 10 sec	600	☒	☐	☐											
	In drive, 10 sec	550	☒	☐	☐											
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☒	☐	☐		
	Accel 30-55 (WOT at Detent)					☒	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☒	☐	☐		
	Accel 15-50 (1/2 Throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☒	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	600	☒	☐	☐											

Stop Engine, Soak 15 Min, Restart: Start Time 20 Sec, Attempts 1

		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	600	☒	☐	☐											
	Accel 0-30 (1/2 Throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☒	☐	☐		
	Accel 30-55 (WOT at Detent)					☒	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☒	☐	☐		
	Accel 15-50 (1/2 Throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☒	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	600	☒	☐	☐											

Comments ____________________

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	Good	Good	Good
Decel 60-30, Sec	Good	Good	Good

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost	Cost	Quantity
. Initial Cost	$35.00	
. Developmental/Prototype		
. Manufacturing		
. Distribution		

3.2 Profit Margins		
. Manufacturer		
. Distributor		
. Dealer/Installer (Retail)		

3.3 Installation on Vehicle		
. Kit/Parts		
. Labor, Hours		

3.4 Recurring Retrofit Costs

. Fuel Economy , miles/gallon	Baseline	Retrofit
City		
Highway		
Composite		
. Parts Replacement Cost		

4. Marketing Information/Plan

I

WITHOUT DEVICE

VEHICLE EMISSION TEST

Date 11/11/71 Car Make Chev Model Year 67
PCV Valve: Yes X No ____ Good X Poor ____ Inoperative ____
Other Emission Control ____

Test Results	50 mph	30 mph	Idle	Average **
Carbon Monoxide (CO) %	.9	1.2	2.8	
Hydrocarbons (HC) ppm	120	160	180	
Nitric Oxide (NO_x) ppm	500	300	150	

Arizona Emission Standards**	Large Engines (> 140 CID)		Small Engines (< 140 CID)	
Model Year	CO - %	HC - ppm	CO - %	HC - ppm
1968 and Later	3.0*	300*	4.0	400
1963 Through 1967	4.5*	500*	5.0	600
1962 and Older	5.0	600	6.0	800

**Based on Average. *Approved. Others Pending. NO_x - Not Yet Defined.

Possible Reasons For Excessive Emissions

High CO - Carburetor set too rich or choke sticking, air cleaner dirty, carburetor malfunctioning (float level, etc.), plugged PCV valve.

High HC - Fouled spark plugs, broken ignition wires, defective distributor, abnormal loss of cylinder compression.

The data included herein is informational only, for the sole use of the owner of the vehicle tested and the State Division of Air Pollution Control. It shall in no way be construed as a certification or approval of any device or fuel or oil additive, nor shall it be considered a repair order or diagnostic data sheet.

ARIZONA STATE DEPARTMENT OF HEALTH
Division of Air Pollution Control
VEC:AAA-0164 (cak/9-15-71)

WITH DEVICE

VEHICLE EMISSION TEST

Date 11/11/71 Car Make Chev Model Year 67
PCV Valve: Yes X No ____ Good X Poor ____ Inoperative ____
Other Emission Control ____

Test Results	50 mph	30 mph	Idle	Average **
Carbon Monoxide (CO) %	1.1	1.5	2.5	
Hydrocarbons (HC) ppm	150	150	200	
Nitric Oxide (NO_x) ppm	450	300	150	

Arizona Emission Standards**	Large Engines (> 140 CID)		Small Engines (< 140 CID)	
Model Year	CO - %	HC - ppm	CO - %	HC - ppm
1968 and Later	3.0*	300*	4.0	400
1963 Through 1967	4.5*	500*	5.0	600
1962 and Older	5.0	600	6.0	800

**Based on Average. *Approved. Others Pending. NO_x - Not Yet Defined.

Possible Reasons For Excessive Emissions

High CO - Carburetor set too rich or choke sticking, air cleaner dirty, carburetor malfunctioning (float level, etc.), plugged PCV valve.

High HC - Fouled spark plugs, broken ignition wires, defective distributor, abnormal loss of cylinder compression.

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ARIZONA STATE DEPARTMENT OF HEALTH
Division of Air Pollution Control
VEC:AAA-[illegible] (cak/9-15-71)

VEHICLE EMISSION TEST

Date 7/29/71 Car Make Chev Model Year 67

PCV Valve: Yes X No ____ Good X Poor ____ Inoperative ____

Other Emission Control ____

Test Results	50 mph	30 mph	Idle	Average **
Carbon Monoxide (CO) %	[illegible]	.1	.1	[illegible]
Hydrocarbons (HC) ppm	50	90	60	66.6
Nitric Oxide (NO_x) ppm	250	200	550	333.3

Arizona Emission Standards**	Large Engines (> 140 CID)		Small Engines (< 140 CID)	
Model Year	CO - %	HC - ppm	CO - %	HC - ppm
1968 and Later	3.0*	300*	4.0	400
1963 Through 1967	4.5*	500*	5.0	600
1962 and Older	5.0	600	6.0	800

**Based on Average. *Approved. Others Pending. NO_x - Not Yet Defined.

Possible Reasons For Excessive Emissions

High CO - Carburetor set too rich or choke sticking, air cleaner dirty, carburetor malfunctioning (float level, etc.), plugged PCV valve.

High HC - Fouled spark plugs, broken ignition wires, defective distributor, abnormal loss of cylinder compression.

The data included herein is informational only, for the sole use of the owner of the vehicle tested and the State Division of Air Pollution Control. It shall in no way be construed as a certification or approval of any device or fuel or oil additive, nor shall it be considered a repair order or diagnostic data sheet.

ARIZONA STATE DEPARTMENT OF HEALTH
Division of Air Pollution Control
VEC:AAA-0164 (cak/9-15-71)

Enclosure 1

RETROFIT INFORMATION OUTLINE

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

. Principles of Operation: Positive Sealed Crankcase Ventilating Device as per attached.

. Installation Reqm'ts: approx. 90 minutes, regular tools required.

. Adjustments: at installation only

. MFG Techniques: machinery & extrusion

1.2 Development Status

Development Status	Number to Date
Conceptual/Design Stage	
Prototype	16
Manufactured	
Distributed to Dealer	
Installed on Vehicles	16
Total Accumulated Miles (Estimated, Thousands)	440,000

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combus-tion	Exhaust				
Hydrocarbon	X				X			
Carbon Monoxide	X				X			
Oxides of Nitrogen	X				X			
Particulates								
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	CM	Ford	Foreign (Specify)
Year (Range)		1968	1960-1969	1967-1971	
Engine CID (Range)				235-350	
Number of Retrofit		1	2	13	
Model Types to Satisfy Application		1	1	1	

2. **Performance Data**

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start ____ 7-Mode Cold-Start X			Federal Tests 1970 X 1972 ____			Other Tests (specify units and test conditions)			Particulates
	HC, PPM	CO, %	NO$_x$, PPM	HC, GPM	CO, GPM	NO$_x$, GPM	HC, ____	CO, ____	NO$_x$, ____	____
Baseline, as received										
Baseline, after tune-up				X	X					
Retrofit device test				X	X					
Number of cars										
Test source										
Additional test data										
Durability Fleet										

Test Data (Attach Data If Available)

2.2 Special Reqm'ts., if any (Fuel,Safety) none

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair

2.5 Periodic Maintenance/ Inspection Requirements

3. **Estimated Cost Information, Dollars**

3.1 Retrofit System Cost	Cost	Quantity
. Initial Cost		
. Developmental/Prototype		
. Manufacturing		
. Distribution		

3.2 Profit Margins		
. Manufacturer		
. Distributor		
. Dealer/Installer (Retail)		

3.3 Installation on Vehicle		
. Kit/Parts	under $20.00 to user	
. Labor, Hours	approx. 90 minutes	

3.4 Recurring Retrofit Costs		
. Fuel Economy , miles/gallon	Baseline	Retrofit
City		
Highway		
Composite		
. Parts Replacement Cost		

4. Marketing Information/Plan ______________________________

____

____

____

Enclosure 1

RETROFIT INFORMATION OUTLINE

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

. Principles of Operation See Exhibits # 1 & # 2 Attached Hereto.

. Installation Reqm'ts See Exhibit # 3 Attached hereto

. Adjustments Idle Jet & Ignition Retarding

. MFG Techniques Mass Production thru Automatic Screw Machined Parts.

1.2 Development Status

1.2 Development Status	Number to Date	
Conceptual/Design Stage	12	See Exhibits 4 & 5 Attached.
Prototype	25	(See Exhibit # 6 (Photo) Attached.
Manufactured	25	
Distributed to Dealer	None Offered	
Installed on Vehicles	15 (All activated)	
Total Accumulated Miles (Estimated, Thousands)	120,000 Plus.	

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combus-tion	Exhaust				
Hydrocarbon	All Tests to date indicate			X	NOTE: We previously forwarded all			
Carbon Monoxide	emission reductions			X	Test Reports to your attention.			
Oxides of Nitrogen	below California Air			X	Duplicate Copies are available in			
Particulates	Resources Board			X	the event you wish them.			
Other	Standards.			X				

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	CM	Ford	Foreign (Specify)
Year (Range)	One Device, with several varable Jet Sizes,				
Engine CID (Range)	will adapt to any make or model automobile,				
Number of Retrofit Model Types to Satisfy Application	or any internal comb. engine, using a carburetor.				

2. Performance Data

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test. Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start ____ 7-Mode Cold-Start ____			Federal Tests 1970 ____ 1972 ____			Other Tests (specify units and test conditions)			Particulates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ___	CO, ___	NO_x, ___	___
Baseline, as received	ALL TEST DATA CONCERNING THIS DEVICE HAS BEEN FORWARDED TO YOUR ATTENTION:									
Baseline, after tune-up	WE WILL GLADLY SEND DUPLICATE COPIES IF REQUIRED.									
Retrofit device test										
Number of cars										
Test source	SCOTT LABORATORIES: CALIF: A.R.B. SPEED SPECIALISTS:									
Additional test data										
Durability Fleet Test Data (Attach Data If Available)										

2.2 Special Reqm'ts., if any (Fuel,Safety) NONE KNOWN. LOW GRADE FUEL SATISFACTORY. NO SAFETY HAZARD COULD BE CREATED BY USE OF OUR RETROFIT DEVICE IF PROPERLY INSTALLED.

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source
100%	100%	1967 Cad.

In excess of 30,000 miles on 1967 Cad Test Car has been attained without any adjustment requirements, or any noticable change in performance.

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
None			None (No moving parts)

2.5 Periodic Maintenance/ Inspection Requirements No Maintenance required normally; A rough running engine at idle would indicate a plugged fuel source. Our Unit with suitable built-in filters would eliminate any chance of a plugged passage.

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make Cadillac Year 1967 Engine CID 429 Transmission M ☐ A ☒

Ambient Temperature ____ °F

Car Preparation Data

Basic Ignition Timing 3½° A.T.C. Degrees

Point Dwell ____ Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 2 sec															
	No. of attempts 1															
	Choke Hi-cam (N) 20 sec		X													
	Kickdown (N) 10 sec		X													
	In drive, 10 sec		X													
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)															
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)					X										
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)															
	Idle, 15 Seconds		X													

ALL TEST RECORDS PREVIOUSLY FORWARDED TO YOUR ATTENTION.

COPIES AVAILABLE IF DESIRED.

Stop Engine, Soak 15 Min, Restart: Start Time 2 Sec, Attempts 1

		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds		X													
	Accel 0-30 (1/2 Throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)															
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)					X										
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)															
	Idle, 15 Seconds		X													

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec			
Decel 60-30, Sec			

Comments This Device works in Ratio with the Carburetor and therefore all performance is as normal as the stock carburetor.

Enclosure 1 cont.

3. Estimated Cost Information, Dollars

PRODUCTION & MATERIAL COSTS WOULD DECREASE IN PERCENTAGE TO VOLUME PRODUCTION

	Cost	Quantity
3.1 Retrofit System Cost		
. Initial Cost	2.00	1
. Developmental/Prototype	25,000	
. Manufacturing	1.00	1
. Distribution		
3.2 Profit Margins (A.E.C. MARK-UP	1.00	1
. Manufacturer	1.00	1
. Distributor	2.00	1
. Dealer/Installer (Retail)	2.95	1
3.3 Installation on Vehicle		
. Kit/Parts	9.95	1
. Labor, Hours (1/2 Hr.Approx.)	10.00	1

SUGGESTED RETAIL PRICE INSTALLED: $19.95

3.4 Recurring Retrofit Costs

	Baseline	Retrofit
. Fuel Economy , miles/gallon		
City		10% - 15% Plus
Highway		10% - 15% Plus
Composite		10% - 15% Plus
. Parts Replacement Cost		NONE

4. Marketing Information/Plan (1) To Sell Direct to Service Centers; To Farm All Production & Sales thru such Companies as , etc.; (3) To Offer License Rights to all Automobile Manufacturers interested in their older products and nation wide Service Centers;

Enclosure 1

RETROFIT INFORMATION OUTLINE

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

. Principles of Operation Previously Sent
. Installation Reqm'ts " "
. Adjustments " "
. MFG Techniques " "

1.2 Development Status

Development Status	Number to Date
Conceptual/Design Stage	5
Prototype	400
Manufactured	18,000
Distributed to Dealer	13,000
Installed on Vehicles	10,000
Total Accumulated Miles (Estimated, Thousands)	45 Million total

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combus-tion	Exhaust				
Hydrocarbon	X		X					
Carbon Monoxide	X		X					
Oxides of Nitrogen	X		X					
Particulates								
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	GM	Ford	Foreign (Specify)
Year (Range)	ALL	ALL	ALL	ALL	See Note 1
Engine CID (Range)	140 CID And Larger		------	------	------
Number of Retrofit Model Types to Satisfy Application	1 & 4 See Note 2 Below		------	------	------

NOTES:
1. Air Needles not applicable to metric threads at present time.
2. One model of fits all automobiles. Four models of air needles to fit various thread and needle configurations of carburetors.

2. Performance Data

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	All Baselines Hot Start 7-Mode Hot-Start 2 7-Mode Cold-Start 5			Federal Tests 1970 ____ 1972 ____			7-Mode Hot Start Other Tests (specify units and test conditions)			Particulates
	HC, PPM	CO, %	NO$_x$, PPM	HC, GPM	CO, GPM	NO$_x$, GPM	HC, ppm	CO, %	NO$_x$, ppm	
Baseline, as received	494	3.14	876				526	2.88	1155	
Baseline, after tune-up	Not Available						Not Available			
Retrofit device test	347	2.03	791	NOT AVAILABLE			313	0.25	1292	
Number of cars	7	7	7				1	1	1	
Test source	American Automotive Testing Lab.						California Air Resources Board			
Additional test data	N.A.									
Durability Fleet	N.A.									

Test Data (Attach Data If Available) All Baseline tests "Hot Start"
Retrofit Tests 5 – "Cold Start", 2 – "Hot Start"

2.2 Special Reqm'ts., if any (Fuel,Safety) Chemical should be kept out of the reach of children – Not fit for human consumption.

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source
Not Available – No failure reported		

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
Not Available			

2.5 Periodic Maintenance/Inspection Requirements Refilling of container every 2,000 to 3,000 miles at a retail cost of $ 1.95 per refill. At time of refill a visual inspection of the system is recommended to see that the unit is aerating and that all connections are secure.

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make Ford Wagon Year 1969 Engine CID 429 Transmission ☐ M ☒ A (XX)

Ambient Temperature 68 °F

Car Preparation Data

Basic Ignition Timing 6 BTDC Degrees

Point Dwell 36 Degrees

Other Special Adjustments: Attach Data Sheet None

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 4.5 sec															
	No. of attempts 1															
	Choke Hi-cam (N) 20 sec	750	x													
	Kickdown (N) 10 sec	700	x													
	In drive, 10 sec	575	x													
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)															
	Cruise 15 (0.1 Mile)											XX				
	Accel 15-50 (1/2 Throttle)					XX										
	Cruise 50 (0.1 Mile)											XX				
	Decel 50-0 (Mod Brake)															
	Idle, 15 Seconds	600	X													

Stop Engine, Soak 15 Min, Restart: Start Time 0.5 Sec, Attempts 1

		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	600	X													
	Accel 0-30 (1/2 Throttle)					x										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)															
	Cruise 15 (0.1 Mile)											XX				
	Accel 15-50 (1/2 Throttle)					XXX										
	Cruise 50 (0.1 Mile)											XX				
	Decel 50-0 (Mod Brake)															
	Idle, 15 Seconds	600	X													

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	12.5 sec	12.0 s	11.5 sec
Decel 60-30, Sec	5.0	4.0	3.5

Note: Brakes applied during decel tests.

Comments Car was not prepared prior to test, test run with an as is condition

Transmission seemed to be shifting improperly and could effect Acceleration trials.

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost

	Cost	Quantity
. Initial Cost	$ 25,000	5
. Developmental/Prototype	$ 65,000	400
. Manufacturing	$ 95,000	18,000
. Distribution	$ 19,000	13,000

3.2 Profit Margins

. Manufacturer	8% of retail	
. Distributor	20% of retail	
. Dealer/Installer (Retail)	50% of retail	

3.3 Installation on Vehicle

. Kit/Parts	$ 42.95 ea plus tax & installation	
. Labor, Hours	½ hour (avg. charge $ 6.00)	

3.4 Recurring Retrofit Costs

. Fuel Economy , miles/gallon	Baseline	Retrofit
City	12.0	14.1
Highway	16.3	18.5
Composite	13.5	15.5
. Parts Replacement Cost		$ 1.95/2,500 miles

4. Marketing Information/Plan The product is currently being marketed on a direct sales program with a distributor selling to direct dealer-salesmen. These dealer-salesmen then sell direct to the consumer.

RETROFIT INFORMATION OUTLINE

Enclosure 1

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

- Principles of Operation Treatment of gasoline and air mixture.
- Installation Reqm'ts Removal of carburetor and gasket.
- Adjustments Lean idle adjustment screws.
- MFG Techniques Catalyst contained/positioned by gasket.

1.2 Development Status

	Number to Date
Conceptual/Design Stage	
Prototype	60
Manufactured	
Distributed to Dealer	
Installed on Vehicles	40
Total Accumulated Miles (Estimated, Thousands)	400

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control							
	Induction	Ignition	Combustion	Exhaust	Crankcase Control	Fuel Evap. Control	Exhaust	Crankcase
Hydrocarbon	x							
Carbon Monoxide	x							
Oxides of Nitrogen	x							
Particulates	x							
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	CM	Ford	Foreign (Specify)
Year (Range)	60-72	55-72	53-72	55-72	No info.
Engine CID (Range)	All	All	All	All	" "
Number of Retrofit Model Types to Satisfy Application	10	12	15	12	" "

2. Performance Data

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start x 7-Mode Cold-Start			Federal Tests 1970 Hot 1972			7-mode hot-start Other Tests (specify units and test conditions)			Particu-lates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, PDM	CO, %	NO_x,	
Baseline, as received										
Baseline, after tune-up	676	3.90	---	220	1.1%	---	136	.74%	---	
Retrofit device test	322	1.95	---	116	.16	---	132	.12%	---	
Number of cars	3	3		1	1			1		
Test source	Scott Laboratory and Davidson Laboratory of Stevens Institute									
Additional test data										
Durability Fleet	Not available - Hopefully in six months									

Test Data (Attach Data If Available)

2.2 Special Reqm'ts., if any (Fuel,Safety) None

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source
Note		

Estimate life to be in excess of 50,000 miles (2 have been run over 40,000 miles, 2 over 30,000 miles all without failure.)

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
0			None

2.5 Periodic Maintenance/ Inspection Requirements No maintenance required.

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make Olds Year 69 Engine CID 455 Transmission M ☐ A ☒

Ambient Temperature 60 °F

Car Preparation Data

Basic Ignition Timing 9 Degrees

Point Dwell 29 Degrees

Other Special Adjustments: Attach Data Sheet *Special Note

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 1 1/2 sec															
	No. of attempts 1															
	Choke Hi-cam (N) 20 sec	2200	X	☐	☐											
	Kickdown (N) 10 sec	1800	X	☐	☐											
	In drive, 10 sec	1100	X	☐	☐											
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					X	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											X	☐	☐		
	Accel 30-55 (WOT at Detent)					X	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											X	☐	☐		
	Accel 15-50 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											X	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	850	x	☐	☐											

Stop Engine, Soak 15 Min, Restart: Start Time 1 Sec, Attempts 1

		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	600	x	☐	☐											
	Accel 0-30 (1/2 Throttle)					x	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											x	☐	☐		
	Accel 30-55 (WOT at Detent)					x	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											x	☐	☐		
	Accel 15-50 (1/2 Throttle)					x	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											x	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	650	x	☐	☐											

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	11	11	11
Decel 60-30, Sec	30	31	31

Comments

*Note: For lowest pollution idle mixture screws leaned by 7/8 turn from factory settings.

3. Estimated Cost Information, Dollars

	Cost	Quantity
3.1 Retrofit System Cost		
. Initial Cost	15-$20.00	Lots of 25M
. Developmental/Prototype	$50	Lots of 1
. Manufacturing	$2.72-$4.04	Lots of 25M
. Distribution	$12.23-$15.81	Lots of 25M
3.2 Profit Margins		
. Manufacturer	50%	Lots of 25M
. Distributor	25%	Lots of 25M
. Dealer/Installer (Retail)	40%	Lots of 25M
3.3 Installation on Vehicle		
. Kit/Parts	$5	1
. Labor, Hours	.25	1

3.4 Recurring Retrofit Costs

. Fuel Economy, miles/gallon	Baseline	Retrofit
City	10	11.5
Highway	14	15
Composite	13	14
. Parts Replacement Cost		0

4. Marketing Information/Plan ______ plans to market through new car dealerships and tune-up shops equipped with pollution instrumentation.

Enclosure 1

RETROFIT INFORMATION OUTLINE

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

. Principles of Operation Already Submitted

. Installation Reqm'ts Information Submitted based on

. Adjustments 1964 figures

. MFG Techniques

1.2 Development Status

	Number to Date
Conceptual/Design Stage	
Prototype	1
Manufactured	
Distributed to Dealer	
Installed on Vehicles	1
Total Accumulated Miles (Estimated, Thousands)	25,000

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combus-tion	Exhaust				
Hydrocarbon	X		X	X	X			
Carbon Monoxide	X		X	X	X			
Oxides of Nitrogen	X		X	X	X			
Particulates	X				X			
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	CM	Ford	Foreign (Specify)
Year (Range)					
Engine CID (Range)					
Number of Retrofit Model Types to Satisfy Application					

Adaptable to fit all Engines & Carburetors. Current prototype is installed on a stock (1961) Chevrolet.

Enclosure 1 cont.

2. Performance Data Submitted - No current tests available at this time. But unit ready for testing.

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start ____ 7-Mode Cold-Start ____			Federal Tests 1970 ____ 1972 ____			Other Tests (specify units and test conditions)			Particu-lates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ____	CO, ____	NO_x, ____	____
Baseline, as received										
Baseline, after tune-up										
Retrofit device test										
Number of cars										
Test source										
Additional test data										
Durability Fleet										

Test Data (Attach Data If Available)

2.2 Special Reqm'ts., if any (Fuel,Safety) None

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair

2.5 Periodic Maintenance/ Inspection Requirements Minimal

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make Chevrolet Year '61 Engine CID 283 Transmission ☐ M ☒ A

Ambient Temperature 75 °F

Car Preparation Data

Basic Ignition Timing Standard Degrees

Point Dwell Standard Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 60 sec															
	No. of attempts 1															
	Choke Hi-cam (N) 20 sec	700	X													
	Kickdown (N) 10 sec	750	X													
	In drive, 10 sec	500	X													
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)														X	
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)					X										
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)														X	
	Idle, 15 Seconds	600	X													

Stop Engine, Soak 15 Min, Restart: Start Time 3 Sec, Attempts 1

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	600	X													
	Accel 0-30 (1/2 Throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)														X	
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)					X										
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)														X	
	Idle, 15 Seconds	600	X													

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	19.0	19.3	19.00
Decel 60-30, Sec	9.0	9.9	9.6

Comments

Enclosure 1 cont.

3. Estimated Cost Information, Dollars

	Cost	Quantity
3.1 Retrofit System Cost		
. Initial Cost		
. Developmental/Prototype		
. Manufacturing		
. Distribution		
3.2 Profit Margins		
. Manufacturer		
. Distributor		
. Dealer/Installer (Retail)		
3.3 Installation on Vehicle		
. Kit/Parts		
. Labor, Hours		

3.4 Recurring Retrofit Costs	Baseline	Retrofit
. Fuel Economy , miles/gallon		
City		
Highway		
Composite		
. Parts Replacement Cost		

4. Marketing Information/Plan Submitted

Enclosure 1

RETROFIT INFORMATION OUTLINE

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

. Principles of Operation **See Attached Document**

. Installation Reqm'ts **Same**

. Adjustments **Same**

. MFG Techniques **Same**

1.2 Development Status

	Number to Date
Conceptual/Design Stage	5
Prototype	5
Manufactured	NONE
Distributed to Dealer	NONE
Installed on Vehicles	5
Total Accumulated Miles (Estimated, Thousands)	20,000

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control							
	Induction	Ignition	Combus-tion	Exhaust	Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
Hydrocarbon	NONE	NONE	NONE	YES	NONE	NONE	NONE	NONE
Carbon Monoxide	NONE	NONE	NONE	YES	NONE	NONE	NONE	NONE
Oxides of Nitrogen	NONE	NONE	NONE	YES	NONE	NONE	NONE	NONE
Particulates	NONE	NONE	NONE		NONE	NONE	NONE	NONE
Other		AIR CONTROL		SEE NOTES ATTACHED	SEE NOTES ATTACHED		SEE NOTES ATTACHED	SEE NOTES ATTACHED

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	CM	Ford	Foreign (Specify)
Year (Range)	ALL	ALL	ALL	ALL	ALL
Engine CID (Range)	ALL	ALL	ALL	ALL	ALL
Number of Retrofit Model Types to Satisfy Application					

SEE "SUMMARY" IN ATTACHED OUTLINE.

2. Performance Data

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start X 7-Mode Cold-Start X			‡ Federal Tests ‡ 1970 ___ 1972 ___			Other Tests (specify units and test conditions)			Particulates
	HC, PPM	CO, %	NO$_x$, PPM	HC, GPM	CO, GPM	NO$_x$, GPM	HC, PPM	CO %	NO$_x$, PPM	
Baseline, as received	500	9.3	-	72	200		500	9.3		
Baseline, after tune-up	500	9.3	-	72	200		500	9.3		
Retrofit device test	17	0.24	131	0.24	5.52	1.97	17.2	0.26		
Number of cars	1	1	1	1	1	1	1	1		
Test source	Montgomery Ward & Company, with Horiba Mexa - Ethyl Corporation									
Additional test data										
Durability Fleet	Unlimited --------									

Test Data (Attach Data If Available) Dynamometer Tests using Procedures prescribed by H.E.W Sec. 85.87, of Title 45, Part 85, dated July 1, 1969

2.2 Special Reqm'ts., if any (Fuel, Safety) Please see attached SUMMARY

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source
Unlimited	100%	Company

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
Unlimited	100%	Company	Spark Plug

2.5 Periodic Maintenance/ Inspection Requirements NONE - Unless the Spark Plug or electronic air-control burn out. This would be indicated by a Red Warning Light on the dash not going out when the internal temperature fails to reach burning levels.

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make **Chevrolet** Year 1969 Engine CID 250 Transmission ☒ M ☐ A

Ambient Temperature ____ °F

Car Preparation Data

Basic Ignition Timing **Std.** Degrees

Point Dwell **Std.** Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 20 sec															
	No. of attempts 1															
	Choke Hi-cam (N) 20 sec	1500	X													
	Kickdown (N) 10 sec	700	X													
	In drive, 10 sec	2500	X													
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☒	☐	☐		
	Accel 30-55 (WOT at Detent)					☒	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☒	☐	☐		
	Accel 15-50 (1/2 Throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☒	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	700	☐	☐	☐											
Stop Engine, Soak 15 Min, Restart: Start Time 20 Sec, Attempts 1																
Hot Start Evaluation	Idle, 15 Seconds	700	☐	☐	☐											
	Accel 0-30 (1/2 Throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☒	☐	☐		
	Accel 30-55 (WOT at Detent)					☒	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☒	☐	☐		
	Accel 15-50 (1/2 Throttle)					☒	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☒	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds	700	☒	☐	☐											

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	SATISFACTORY		
Decel 60-30, Sec	SATISFACTORY		

Comments **No trouble experienced in operating the Test Vehicle in all MODES.**

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost	Cost	Quantity
. Initial Cost	$1,500	5
. Developmental/Prototype	Same	5
. Manufacturing	$80.00	1
. Distribution	Unknown	

3.2 Profit Margins		
. Manufacturer	See 4	
. Distributor	See 4	
. Dealer/Installer (Retail)	See 4	

3.3 Installation on Vehicle		
. Kit/Parts	$20.00	1
. Labor, Hours	2	

3.4 Recurring Retrofit Costs		
. Fuel Economy, miles/gallon	Baseline	Retrofit
City	17	15
Highway	18-20	15
Composite		
. Parts Replacement Cost		$1.85

4. Marketing Information/Plan The Company plans to negotiate the manufacturing and marketing of the Device and related System and obtain a franchise royalty as mutually agreed upon. Profit margins will be established by the manufacturer. It might be well to point out that the overall net cost of the System can be reduced by the normal cost of the muffler which it will replace. It can be a far better noise abater than the normal muffler.

Enclosure 1

RETROFIT INFORMATION OUTLINE

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

- . Principles of Operation See catalog, pages 1-3, 45, 46
- . Installation Reqm'ts See catalog, page 45, see attachment 2 & 3
- . Adjustments See catalog, page 45
- . MFG Techniques Manufactured by subcontractors; inspected, assembled, and packed at our plant.

1.2 Development Status

	Number to Date
Conceptual/Design Stage	
Prototype	
Manufactured	
Distributed to Dealer	
Installed on Vehicles	30,000 est.
Total Accumulated Miles (Estimated, Thousands)	600,000 M

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control							
	Induction	Ignition	Combustion	Exhaust	Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
Hydrocarbon	X				X			
Carbon Monoxide	X				X			
Oxides of Nitrogen								
Particulates	X				X			
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	CM	Ford	Foreign (Specify)
Year (Range)	All	All	All	All	All
Engine CID (Range)	All	All	All	All	All
Number of Retrofit Model Types to Satisfy Application	1*	1*	1*	1*	1*

*Valve size depends upon CID of engine. All other modifications are kit adaptations, i.e., brass fittings, hose adaptors - see catalog.

2. Performance Data

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start X 7-Mode Cold-Start ____			Federal Tests 1970 ____ 1972 ____			Other Tests (specify units and test conditions)			Particulates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ____	CO, ____	NO_x, ____	____
Baseline, as received	191	0.75%	1859							
Baseline, after tune-up	-	-	-							
Retrofit device test	154	0.23%	1785							
Number of cars	1	1	1							
Test source	Olson Laboratories, Inc., Dearborn, Michigan									
Additional test data										
Durability Fleet										

Test Data (Attach Data If Available) See attachments 4, 5, 6

2.2 Special Reqm'ts., if any (Fuel, Safety) None

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source
15,000*		Scott Laboratories

*Average service requirements; no record of failure

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
.8 hours			Filter Element

2.5 Periodic Maintenance/Inspection Requirements Visual inspection of residue in condensate jar (5,000 miles); change filter elements (15,000 miles); check condition of hose and valve (annually).

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make Ford Year 1968 Engine CID 302 Transmission M ☐ A ☒

Ambient Temperature 60 °F

Car Preparation Data

Basic Ignition Timing 6 BTDC Degrees

Point Dwell 28 Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time 3 sec															
	No. of attempts 1															
	Choke Hi-cam (N) 20 sec	700	X													
	Kickdown (N) 10 sec	600	X													
	In drive, 10 sec	550	X													
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)															
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)					X										
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)															
	Idle, 15 Seconds	550	X													

Stop Engine, Soak 15 Min, Restart: Start Time 1 Sec, Attempts 1

		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds	550	X													
	Accel 0-30 (1/2 Throttle)					X										
	Cruise 30 (0.1 Mile)											X				
	Accel 30-55 (WOT at Detent)					X										
	Decel 55-15 (Mod Brake)															
	Cruise 15 (0.1 Mile)											X				
	Accel 15-50 (1/2 Throttle)					X										
	Cruise 50 (0.1 Mile)											X				
	Decel 50-0 (Mod Brake)															
	Idle, 15 Seconds	550	X													

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec	14 sec.	13 sec.	14 sec.
Decel 60-30, Sec	21 sec.	23 sec.	23 sec.

Comments Test performed on 10/9/71. The engine had 95,360 miles and was equipped from delivery with Engine Vent System.

3. Estimated Cost Information, Dollars

	Cost	Quantity
3.1 Retrofit System Cost		
· Initial Cost	$59.70	1
· Developmental/Prototype		
· Manufacturing		
· Distribution	$34.82	
3.2 Profit Margins		
· Manufacturer		
· Distributor	No Dist.	
· Dealer/Installer (Retail)	$23.88	1
3.3 Installation on Vehicle		
· Kit/Parts	Included in	initial cost
· Labor, Hours	$10.00 recommended	

3.4 Recurring Retrofit Costs	Baseline	Retrofit
· Fuel Economy, miles/gallon		
City		2-4 MPG
Highway		3-5 MPG
Composite		2-1/2 - 4-1/2 MPG
· Parts Replacement Cost		$3.95 filter cost

4. Marketing Information/Plan Presently establishing dealer network in materials handling field with exceptional results. The unit is now OEM on some Clark, Hyster, Yale, and Pettibone Mercury models. We are also conducting full scale advertising in trade journals, such as Modern Materials Handling and Materials Handling and Engineering Magazines. This is now being negotiated to expand to other media avenues.

SEE ATTACHED

RETROFIT INFORMATION OUTLINE

Enclosure 1

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

- Principles of Operation
- Installation Reqm'ts } See attached report
- Adjustments
- MFG Techniques stamping

1.2 Development Status

	Number to Date
Conceptual/Design Stage	2
Prototype	
Manufactured	
Distributed to Dealer	
Installed on Vehicles	1
Total Accumulated Miles (Estimated, Thousands)	26,453

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combus-tion	Exhaust				
Hydrocarbon	✓	✓						
Carbon Monoxide	✓	✓						
Oxides of Nitrogen	✓	✓						
Particulates								
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	GM	Ford	Foreign (Specify)
Year (Range)					
Engine CID (Range)					
Number of Retrofit		unknown at this time			

Model Types to Satisfy Application Device can be installed on all engine models and makes, except those with a restriction (butterfly plates, etc) below the carburetor

Enclosure 1 cont.

2. Performance Data

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start ___ 7-Mode Cold-Start ✓			Federal Tests 1970 ___ 1972 ✓			Other Tests (specify units and test conditions)			Particu-lates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ___	CO, ___	NO_x, ___	___
Baseline, as received										
Baseline, after tune-up	728 (1)	2.18 (1)	754 (1)	3.96 (1)	73.73 (1)	5.06 (1)				
Retrofit device test				3.52 (2)	63.89 (2)	3.39 (2)	(standard metering both cars)			
Number of cars ( )				.44/3.96 ⑪	9.84/73.73 ⑬	1.67/5.06 ㉝	7.			
Test source	STEVENS INSTITUTE OF TECHNOLOGY & SCOTT RESEARCH LABORATORIES INC.									
Additional test data										
Durability Fleet				3.55 (1)	36.30 (1)	2.69 (1)	(lean	main metering)		

Test Data (Attach Data If Available)

3.3 + 4.3 + 10.7 = 18.3 WTO

2.2 Special Reqm'ts., if any (Fuel, Safety) none

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source
not established	estimated at	car life

(To date - 23,000 miles accumulated on 1 car - no failure, can be reinstalled)

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
not established			

2.5 Periodic Maintenance/Inspection Requirements 10,000 mile normal tuneup

(stop watch and fifth wheel not available to run reliable tests)

2.6 Drivability Evaluation-Retrofit Device Installed: Please Conduct Evaluation and Check Applicable Boxes. See Enclosure 2 For Drivability Procedure, Page 4.

Make __________ Year______ Engine CID_______ Transmission ☐ M ☐ A

Ambient Temperature _____°F

Car Preparation Data

Basic Ignition Timing ____Degrees

Point Dwell _____Degrees

Other Special Adjustments: Attach Data Sheet

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Cold Start/Idle	Soak 12 hours minimum															
	Start to run time_____sec															
	No. of attempts_______															
	Choke Hi-cam (N) 20 sec		☐	☐	☐											
	Kickdown (N) 10 sec		☐	☐	☐											
	In drive, 10 sec		☐	☐	☐											
Cold Start Drive-Away	Accel 0-30 (1/2 throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☐	☐	☐		
	Accel 30-55 (WOT at Detent)					☐	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☐	☐	☐		
	Accel 15-50 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☐	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds		☐	☐	☐											

Stop Engine, Soak 15 Min, Restart: Start Time_____Sec, Attempts ______

		Idle Mode				Accel. Mode						Cruise			Decel	
		Engine RPM	Satisfactory	Rough	Stall	Satisfactory	Detonation	Stretchiness	Stumble	Hesitation	Sag	Satisfactory	Surging	Detonation	Stall	Backfire
Hot Start Evaluation	Idle, 15 Seconds		☐	☐	☐											
	Accel 0-30 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 30 (0.1 Mile)											☐	☐	☐		
	Accel 30-55 (WOT at Detent)					☐	☐	☐	☐	☐	☐					
	Decel 55-15 (Mod Brake)														☐	☐
	Cruise 15 (0.1 Mile)											☐	☐	☐		
	Accel 15-50 (1/2 Throttle)					☐	☐	☐	☐	☐	☐					
	Cruise 50 (0.1 Mile)											☐	☐	☐		
	Decel 50-0 (Mod Brake)														☐	☐
	Idle, 15 Seconds		☐	☐	☐											

Performance	Trial 1	Trial 2	Trial 3
WOT Accel 0-60, Sec			
Decel 60-30, Sec			

Comments ____________________

Enclosure 1 cont.

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost	Cost	Quantity
· Initial Cost		
· Developmental/Prototype		
· Manufacturing		
· Distribution		
3.2 Profit Margins		
· Manufacturer		
· Distributor		
· Dealer/Installer (Retail)	$5-10.00	each
3.3 Installation on Vehicle		
· Kit/Parts	$5-10.00	
· Labor, Hours	$10-15.00	1/2 hour

3.4 Recurring Retrofit Costs		
· Fuel Economy, miles/gallon	Baseline	Retrofit
City		
Highway		
Composite (1 vehicle)	13.50 M.P.G.	15.93 M.P.G.
· Parts Replacement Cost		$0.00

4. Marketing Information/Plan not established - contemplating licensing for manufacture and sale of the device

OCT 8 REC'D

RETROFIT INFORMATION OUTLINE Enclosure 1

Please collate with patent copy and performance summary submitted to Dearborn office 9/13/71.

1. System Information

1.1 Retrofit System Description (use extra pages or attach catalog)

- Principles of Operation Wet film flow into manifold is intercepted and dispersed by non-wettable coated blades.
- Installation Reqm'ts ~~Lift carburetor.~~
- Adjustments Readjust idle in normal manner, usually ¼ turn leaner.
- MFG Techniques Sheet metal stamping, proprietary coating.

1.2 Development Status

	Number to Date
Conceptual/Design Stage	
Prototype	20
Manufactured	
Distributed to Dealer	
Installed on Vehicles	20
Total Accumulated Miles (Estimated, Thousands)	Est. 600,000

1.3 Emission Control Category (check applicable box)

	Mechanical Modification						Fuel Modification	
	Exhaust Control				Crank-case Control	Fuel Evap. Control	Exhaust	Crank-case
	Induction	Ignition	Combus-tion	Exhaust				
Hydrocarbon	X							
Carbon Monoxide	X							
Oxides of Nitrogen	?							
Particulates	X							
Other								

1.4 Automotive Adaptability (Attach catalog if available)

Light Duty Vehicles Less Than 6000 Lb GVW

	AMC	Chrysler	GM	Ford	Foreign (Specify)
Year (Range)					
Engine CID (Range)					
Number of Retrofit					

Model Types to Satisfy Application Models will need match diversity of carburetor flange designs. Approximately 10 models should cover 90% or more of existing cars. Estimated tooling cost is about $3000 each.

2. Performance Data

Enclosure 1 cont.

2.1 Exhaust Emission Performance (Avg Value if More than One Test, Please Attach Supporting Data).

None available.

Please attach additional test data if available	Exhaust Emission Measurements, Fill In Applicable Blanks									
	7-Mode Hot-Start ____ 7-Mode Cold-Start ____			Federal Tests 1970 ____ 1972 ____			Other Tests (specify units and test conditions)			Particu-lates
	HC, PPM	CO, %	NO_x, PPM	HC, GPM	CO, GPM	NO_x, GPM	HC, ___	CO, ___	NO_x, ___	____
Baseline, as received										
Baseline, after tune-up										
Retrofit device test										
Number of cars										
Test source										
Additional test data										
Durability Fleet										

Test Data (Attach Data If Available)

2.2 Special Reqm'ts., if any (Fuel,Safety) **Discarded device should not be incinerated as fluorinated coating will liberate toxic gas.**

2.3 Reliability (mean mileage between failure, MMBF)

MMBF Miles	Confidence	Test Source

Only failure was fatigue fracture of soft aluminum blade after 2 years and 40,000 miles. Coating was still effective

2.4 Maintainability (mean time to repair, MTTR)

MTTR, Hours			Parts Required for Repair
½			**Replace plate.**

2.5 Periodic Maintenance/ Inspection Requirements **none required.**

3. Estimated Cost Information, Dollars

3.1 Retrofit System Cost

	Cost	Quantity
. Initial Cost	$3.00	100,000
. Developmental/Prototype	Nominal	sample
. Manufacturing	.75	100,000
. Distribution	2.25	"

3.2 Profit Margins

. Manufacturer	35% Gross	100,000
. Distributor	50% "	
. Dealer/Installer (Retail)	50% "	

3.3 Installation on Vehicle

. Kit/Parts	$3.00	
. Labor, Hours	½	

3.4 Recurring Retrofit Costs

. Fuel Economy, miles/gallon	Baseline	Retrofit
City	10-13	12-16
Highway	13-16	15-21
Composite	Depends on	driving mix
. Parts Replacement Cost	13	None 10

Typical result for medium size 8 cyl. cars.

4. Marketing Information/Plan Device is protected by U. S. patent 3,393,984. Entire patent right is owned by Franklin O. Wisman who stands ready to discuss non-exelusive licensing with qualified applicants. Best retrofit exploitation of device is believed to be as part of a super carburetor overhaul kit which would include leaner main jets tailored to the capability of each model engine.

APPENDIX V-4

DEVELOPER INDEX OF EVALUATED RETROFIT DEVICES (ALPHABETICALLY ARRANGED)

This appendix provides an alphabetical listing of developers whose devices were evaluated for retrofit use in controlling used car emissions.

NOTE: Appendix V-1 contains a list of all developers and sources of information contacted regarding retrofit devices.

DEVELOPMENT SOURCE	DEVICE AND/OR FILE NO.	HARDWARE TYPE		VOL II REF PAR.
		CLASS NO.	DEVICE NAME	
Adaks Products, Inc. 285 Mount Read Blvd. Rochester, N. Y. 14611	1	1.2.1	Air Bleed to Intake Manifold	4.1.1
Algas Industries 2657 Andjou Ave. Dallas, Tex. 75220	466	1.4.1	LPG-Gasoline Dual-Fuel Conversion	6.1.2
American Pollution Controlled, Incorporated 19900 E. Colfax Ave. Aurora, Colo. 80010	10	1.2.2	Throttle-Controlled Exhaust Gas Recirculation with Vacuum Advance Disconnect	4.2.1
Auto Pollution Control Corp. P.O. Box 392 Gresham, Ore. 97030	433	1.2.1	Air-Vapor Bleed to Intake Manifold	4.1.4
Automotive Association International Inc. 75 Narcissa Dr. Portuguese Bend, Calif. Tel (213) 377-8507	170	2.1	Closed Blowby Control System	7.1.2
Automotive Emissions Control Corp. (AEC) Louisville, Ky.	462	1.2.1	Air Bleed to Intake and Exhaust Manifolds	4.1.8
Automotive Exhaust Control Corp. 2824 51st Street South St. Petersburg, Fla. 33707 Tel (813) 341-6462	317	1.2.4	Carburetor Modification with Vacuum Advance Disconnect	4.4.5
Bendix Corporation Motor Component Div. 1931 Oakwood Ave. Elmira, N. Y. 14903	22	1.2.6	Electronic Fuel Injection	4.6.1
Biap Enterprises (Address unknown)	23	1.3.2	Electronic Ignition Unit	5.2.1
Bodai, Conrad A., PhD Environmental Scientific Assn. 319 San Miguel Dr. Arcadia, Calif. 91006 Tel (213) 445-1263	288	1.2.4	Carburetor Main Discharge Nozzle Modification	4.4.3

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DEVELOPMENT SOURCE	DEVICE AND/OR FILE NO.	HARDWARE TYPE		VOL II REF PAR.
		CLASS NO.	DEVICE NAME	
Brisko's Mileage-Saver, Inc. P.O. Box 38 Ojibwa, Wis. Tel Winter 2691	24	2.1	Heavy Duty Positive Crankcase Control Valve with Air Bleed	7.1.1
Chromalloy American Corp. 2100 W. 139th St. Gardena, Calif. 90249 Tel (213) 770-1860	31	1.1.2	Thermal Reaction by Turbine Blower Air Injection	3.2.4
Clean Environment, Inc. 3445 38th St., N. W. Washington, D.C. 20016	425	1.1.3	Exhaust Gas Afterburner	3.3.2
Colspan, Inc. P.O. Box 3467 Boulder, Colo. 80303	33	1.2.4	Carburetor Modification, Main Jet Differential Pressure	4.4.1
Combustion Chemicals 15720 Ventura Blvd. Encino, Calif. 91316 Tel (213) 986-0181	182	1.4.2	Fuel and Oil Additives	6.2.1
Consolidated Engineering Technology Corporation Subsidiary of Technology, Inc. 71 Forest Brockton, Mass.	36	1.4.3	Fuel Conditioning by Exposure to Electromagnetic Field	6.3.1
Corona Engineering 2856 S[illegible]ow Dr. Richmond, Calif. 94806	259	1.3.2	Photocell-Controlled Ignition System	5.2.3
Dana Perfect Circle Division 552 S. Washington St. Hagerstown, Ind. 47346	246	1.2.2	Speed-Controlled Exhaust Gas Recirculation with Vacuum Advance Disconnect	4.2.3
Delta Products, Inc. 630 S. 7th St. Grand Junction, Colo. 81501 Tel (303) 242-9000	268	1.3.2	Capacitive Discharge Ignition	5.2.4
E.I. du Pont de Nemours & Co. Petroleum Chemicals Division 612 S. Flower St. Los Angeles, Calif. 90017 Tel (213) 624-1354	244	1.1.2	Rich Thermal Reactor	3.2.1

DEVELOPMENT SOURCE	DEVICE AND/OR FILE NO.	HARDWARE TYPE		VOL II REF PAR.
		CLASS NO.	DEVICE NAME	
E.I. du Pont de Nemours & Co. (refer to Device 244)	469	4.0	Rich Thermal Reactor with Exhaust Gas Recirculation and Particulate Control	9.4
Eastman, Ernest A. Box 73, Smith St. Sedona, Ariz. 86336 Tel (602) 282-3540	308	1.1.3	Exhaust Gas Afterburner	3.3.1
Emission Control Technology Inc. 950 N. Main St. Orange, Calif. 92667	175	1.3.1	Ignition Timing Modification with Lean Idle Adjustment	5.1.2
Energy Sciences, Inc. 343 Coral Circle El Segundo, Calif. 90245 Tel (213) 322-6368	418	1.2.1	Air Bleed to Intake Manifold	4.1.6
Energy Transmission Corp. Subsidiary of Doughboy Industries, Inc. 2360 Cabrera San Bernardino, Calif.	294	1.2.2	Exhaust Gas Recirculation with Carburetor Modification	4.2.4
Engelhard Minerals & Chemical Corporation Engelhard Industries Division 429 Delaney St. Newark, N. J. 07105	292	1.1.1	Catalytic Converter	3.1.2
Engine Accessories Manufacturing Company 5809 E. Beverly Blvd. Los Angeles, Calif. Tel (213) 723-4978	457	1.4.2	Water Injection	6.2.4
Esso Research and Engineering Company P.O. Box 111 Linden, N. J. 07036	463	1.1.2	Rich Thermal Reactor with Exhaust Gas Recirculation and Spark Retard	3.2.2
Ethyl Corporation 100 Park Ave. New York, N. Y. 10017	468	1.1.2	Lean Thermal Reactor with Exhaust Gas Recirculation	3.2.3
Ferry Cap & Set Screw 2151 Scranton Rd. Cleveland, Ohio 44113	42	1.2.1	Air Bleed to Intake Manifold	4.1.2

DEVELOPMENT SOURCE	DEVICE AND/OR FILE NO.	HARDWARE TYPE		VOL II REF PAR.
		CLASS NO.	DEVICE NAME	
Hydro-Catalyst Corp. 60 E. 42nd St. New York, N. Y. 10017 Tel (201) 946-4195	384	1.2.3	Air-Fuel Mixture Diffuser	4.3.4
IMPCO, Division of A.J. Industries 16916 Gridley Pl. Cerritos, Calif. 90701 Tel (213) 860-6666	52	1.4.1	LPG Conversion	6.1.1
Jackson, Otis 6325 Lagrande Detroit, Mich. Tel (313) 892-6689	164	1.1.4	Exhaust Gas Filter	3.4.1
J. & S. Carb. Company P.O. Box 10391 Dallas, Tex. 75207	282	1.4.2	LP Gas Injection	6.2.3
Kar Products, Inc. 461 N. 3rd Ave. Des Plaines, Ill. 60016	427	2.1/2.2	Closed or Open Blowby Control System with Filter	7.2.2
Kolb, Richard G. 540 Princeton St. New Milford, N. J.	430	1.2.3	Induction Modification	4.3.2
Landrum, Porter 7225 Second Ave., South Birmingham, Ala. Tel (205) 595-0251	56	1.2.4	Crankcase Blowby and Idle Air Bleed Modification	4.4.2
Litvak & Attorney's at Law Box 1953 Denver, Colo. 80201 Tel (303) 266-0381	57	1.2.1	Air Bleed with Exhaust Gas Recirculation and Vacuum Advance Disconnect	4.1.3
Manceri, A. S. Controlled Ignition Electronics 9446 Borson St. Downey, Calif.	296	1.3.2	Ignition Timing and Spark Modification	5.2.5
Manfredi Enterprises 2947 Loran Ave. Cleveland, Ohio Tel 651-8484	59	4.0	Three-Stage Exhaust Gas Control System	9.1

DEVELOPMENT SOURCE	DEVICE AND/OR FILE NO.	HARDWARE TYPE		VOL II REF PAR.
		CLASS NO.	DEVICE NAME	
Marvel-Schebler Division Borg Warner Corporation 2195 South Elwin Rd. Decatur, Ill. 62525	459	1.4.1	LPG Conversion with Deceleration Unit	6.1.3
Mitsui 8-7-1 Shimorenjaku Mitaka - City Tokyo, Japan	62	1.1.1	Catalytic Converter	3.1.3
Nycal Co., Inc. 700 Washington Ave. Carlstadt, N. J. 07072	315	2.1	Closed Blowby Control System	7.1.3
Oildex Corporation P.O. Box 3755 Long Beach, Calif. 90803	160	2.2	Closed or Open Blowby Control System with Filter	7.2.1
Optimizer Control Corp. 5309 Edina Industrial Blvd. Minneapolis, Minn. 55435 Tel (612) 941-6161	69	1.3.1	Electronic-Controlled Vacuum Advance Disconnect and Carburetor Lean Idle Modification	5.1.1
Pacific Lighting Service Co. 720 S. Flower St. Los Angeles, Calif. 90054	460	1.4.1	Compressed Natural Gas Dual-Fuel Conversion	6.1.6
Penkova, Charles 147 E. 18th St. Costa Mesa, Calif. Tel (714) 646-0016	165	4.0	Exhaust Gas Afterburner/Recirculation with Blowby and Fuel Evaporation Recirculation	9.2
Pollution Abatement System 9001 Rosehill Rd. Jenexa, Kansas 66215 Tel (913) 888-1221	172	1.2.3	Intake Manifold Modification	4.3.1
Pollution Controls Industries, Incorporated 2207 Border Ave. Torrance, Calif. 90501	295	1.2.4	Carburetor with Variable Venturi	4.4.4
Production System (1)	467	3.0	Fuel Evaporation Control System	8.1

(1) This device represents a fuel evaporation control system used on new model vehicles. The device was evaluated for retrofit cost feasibility.

DEVELOPMENT SOURCE	DEVICE AND/OR FILE NO.	HARDWARE TYPE		VOL II REF PAR.
		CLASS NO.	DEVICE NAME	
REI Industries, Inc. 2344 Farington Dallas, Tex. 75207 Tel (214) 638-8270	95	1.3.2	Ignition Spark Modification	5.2.2
Riverside Auto Repair 4170 Soto St. Riverside, Calif.	408	4.0	Exhaust Gas and Blowby Recirculation with Intake Vacuum Control and Turbulent Mixing	9.3
Saranga Research Center Inc. South Delsea Drive, R. D. #2 Millville, New Jersey 08332 Tel (609) 825-8556	279	1.4.3	Fuel Conditioner	6.3.2
Servi-Tech, Inc. A Division of Silvex Industries 122 Navajo St. Salt Lake City, Utah 84104	325	1.2.1	Air-Vapor Bleed to Intake Manifold	4.1.4
Sky Corporation Stockton, Calif.	458	1.2.1	Air Bleed to Intake Manifold	4.1.7
Texaco, Inc. P. O. Box 509 Beacon, N. Y. 12508	93	1.1.1	Catalytic Converter with Exhaust Gas Recirculation, Spark Modification, and Lean Idle Mixture	3.1.4
Turbo Injector Sales Suite 203 Executive Building 115 S. 17th St. Paducah, Ky. 42001	401	1.2.1	Air-Vapor Bleed to Intake Manifold	4.1.5
Universal Oil Products 30 Algonquin Rd. Des Plaines, Ill. 60016	96	1.1.1	Catalytic Converter with Distributor Vacuum Advance Disconnect	3.1.1
Varicam 10457 Roselle St. San Diego, Calif. 92121	245	1.2.2	Variable Camshaft Timing	4.2.2
Wallace-Murray Corporation Schwitzer Division 299 Park Ave. New York, N. Y. 10017 Tel (212) 758-4000	100	1.2.5	Turbocharger	4.5.1

DEVELOPMENT SOURCE	DEVICE AND/OR FILE NO.	HARDWARE TYPE		VOL II REF PAR.
		CLASS NO.	DEVICE NAME	
Wilford, E. O. 300 Linden Ave. Merion Sta., Penn. 19066	322	1.1.5	Exhaust Gas Backpressure Valve	3.5.1
Wiseman, F. O. Route 8, Box 431 Chambersburg, Penn. 17201	440	1.2.3	Air-Fuel Mixture Deflection Plate	4.3.3
Refer to EPA Test Report 71-21	461	1.4.1	LPG Conversion with Exhaust Reactor Pulse Air Injection and Exhaust Gas Recirculation	6.1.4
Refer to EPA Test Report 72-4	464	1.4.1	Methanol Fuel Conversion with Catalytic Converter	6.1.5
Refer to EPA Test Report 71-24	465	1.4.2	Fuel Additive	6.2.2